Products Finishing

CLEANING
PLATING
POLISHING
FINISHING

APRIL 1952

Saving Nickel

Lea Copper-Glo

Something New in Bright High Speed Copper Plating

The Ronal Bright Copper Process* using Lea Copper-Glo is the answer to the platers' prayers because it answers the problem of extreme nickel shortages.

Lea Copper-Glo makes it practicable to plate properly prefinished steel and die-castings *directly* with chromium without any intermediate buffing operation. It makes it possible for you to forget your nickel worries.

The user of Lea Copper-Glo enjoys numerous advantages as for example:

OPERATING

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- **High current density with 100% efficiency**
- **Exceptional throwing power**
- **No wetting agents required**
- **Direct, interrupted or periodic reverse current**

COST SAVINGS

- **Reduces tank plating time due to high speed operation. (Hull cell bright current density range 10-60 amp./ft.²)**
- **Reduces rejects whether followed by bright nickel or otherwise; since it contains no wetting agents**
- **Reduces brightener costs to a few cents/100 gallons of plating solution per day**

The Ronal Bright Copper Process using Lea Copper-Glo can be fitted into your plant operating cycle. Regular cyanide or Rochelle Copper baths can be readily converted to obtain these advantages. Write for further information.

* The Ronal Bright Copper Process, using Lea Copper-Glo®, is a development of Ronal Chemicals, Brooklyn, N. Y.

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Better cleaning cuts costs in aircraft production. This 48-page illustrated booklet outlines all the big cleaning jobs. Have you seen the latest Oakite recommendations on:

¶ How to clean aluminum in preparation for anodizing? *See page 4.*

¶ How to prepare aluminum for spot welding? *See page 10.*

¶ How to remove welding flux? *See page 14.*

¶ How to prepare aluminum for painting? *See page 15.*

¶ How to clean aluminum before and after heat treating? *See page 20.*

¶ How to strip paint from aluminum? *See page 22.*

¶ How to clean magnesium? *See page 27.*

¶ How to select and install cleaning tanks, rinse tanks and spray-washing machines? *See pages 31 to 35.*

¶ How to treat water in paint spray booths? *See page 36.*

¶ How to clean engine test cells? *See page 40.*

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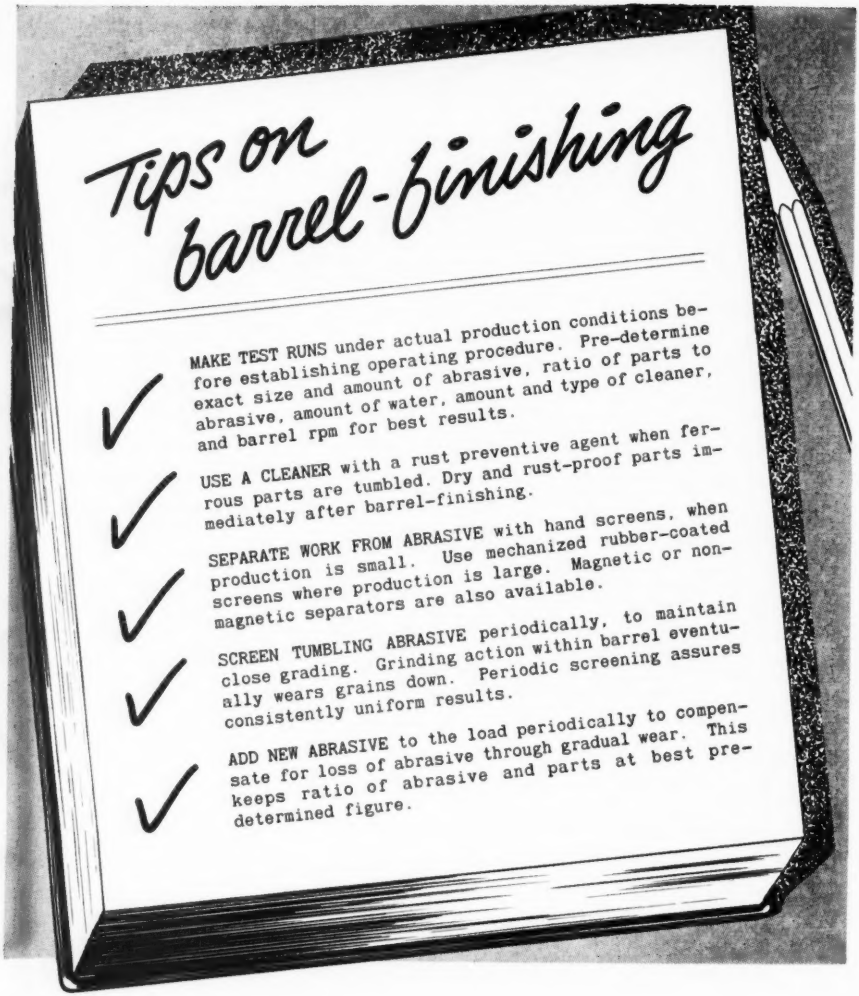
Tips on barrel-finishing
MAKE TEST RUNS under actual production conditions before establishing operating procedure. Pre-determine exact size and amount of abrasive, ratio of parts to abrasive, amount of water, amount and type of cleaner, and barrel rpm for best results.
USE A CLEANER with a rust preventive agent when ferrous parts are tumbled. Dry and rust-proof parts immediately after barrel-finishing.
SEPARATE WORK FROM ABRASIVE with hand screens, when production is small. Use mechanized rubber-coated screens where production is large. Magnetic or non-magnetic separators are also available.
SCREEN TUMBLING ABRASIVE periodically, to maintain close grading. Grinding action within barrel eventually wears grains down. Periodic screening assures consistently uniform results.
ADD NEW ABRASIVE to the load periodically to compensate for loss of abrasive through gradual wear. This keeps ratio of abrasive and parts at best predetermined figure.

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Products Finishing

APRIL 1952
VOLUME 16 • NUMBER 7

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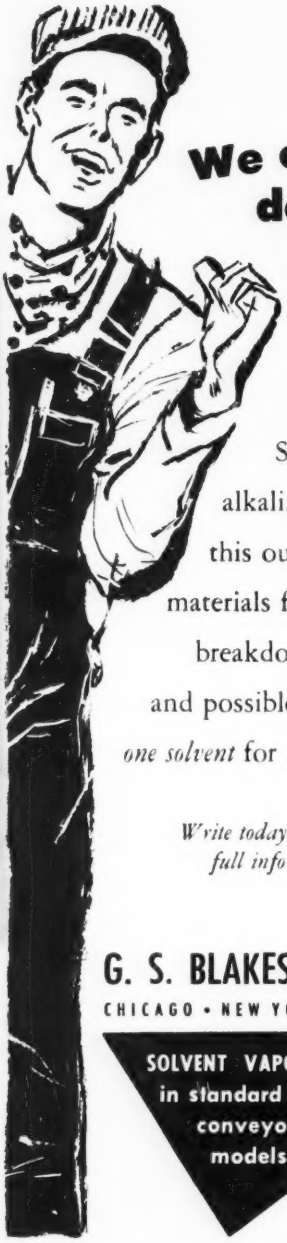

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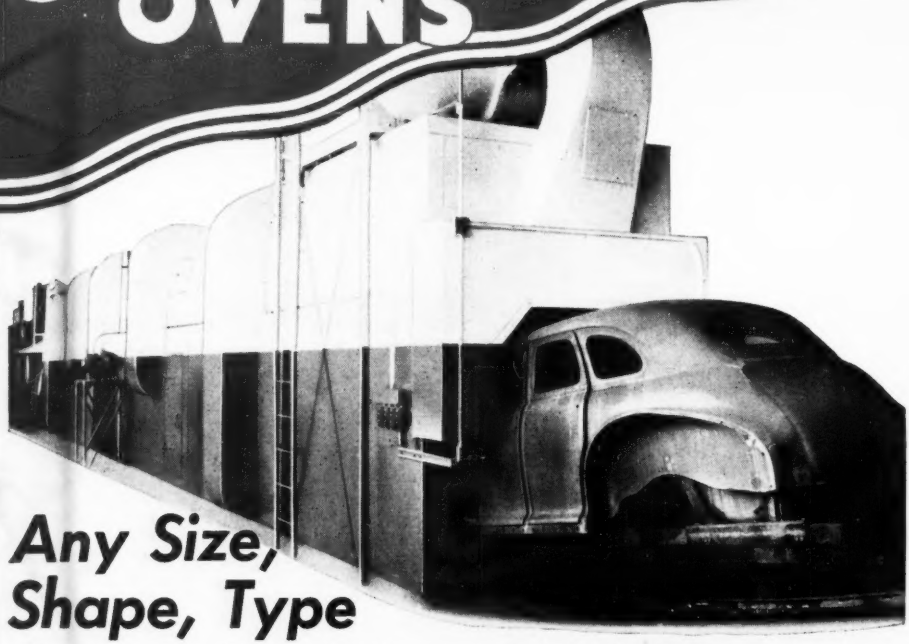

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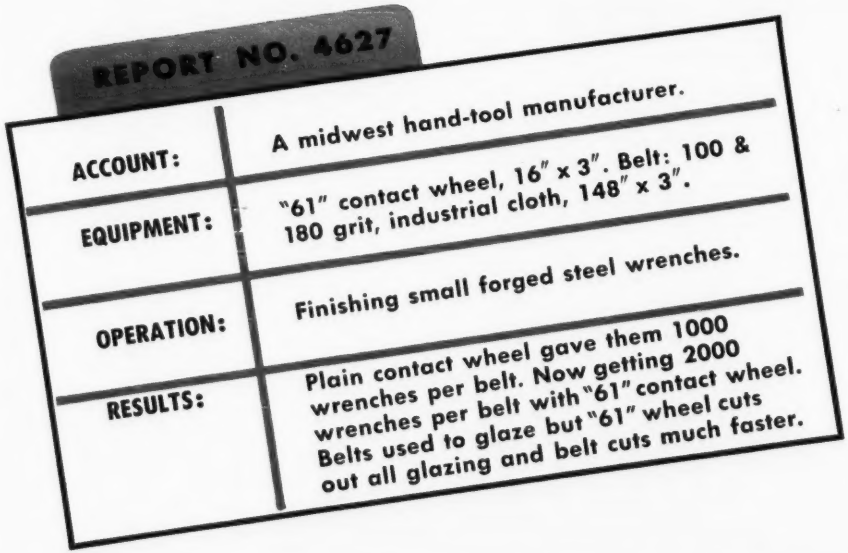
REPORT NO. 4627
ACCOUNT:
A midwest hand-tool manufacturer.
EQUIPMENT:
"61" contact wheel, 16" x 3". Belt: 100 & 180 grit, industrial cloth, 148" x 3".
OPERATION:
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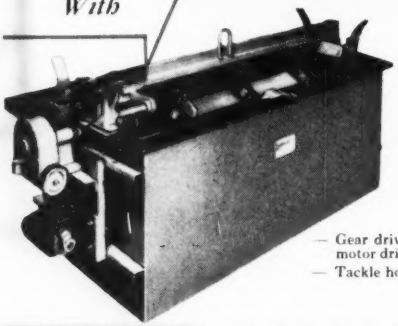

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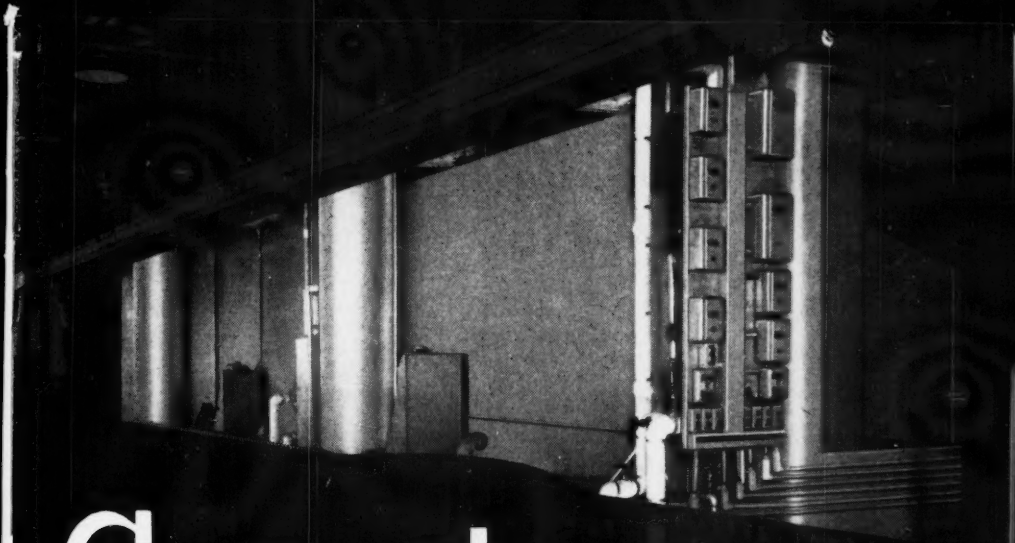

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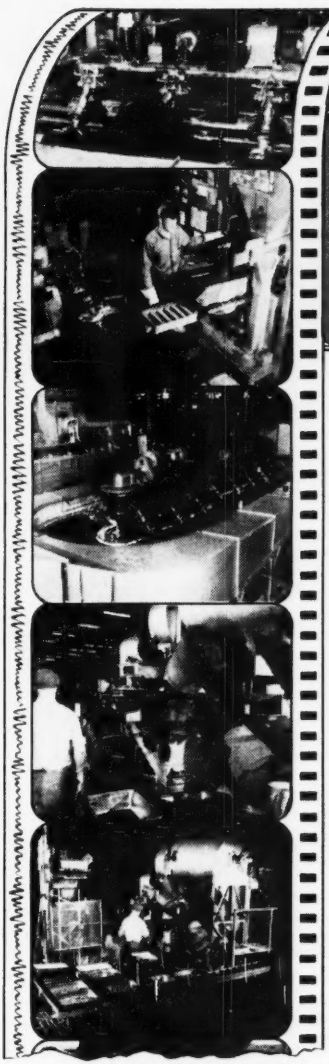

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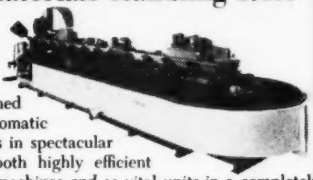

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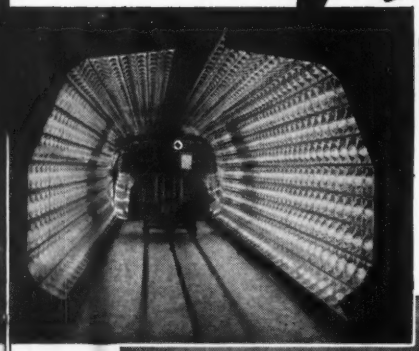

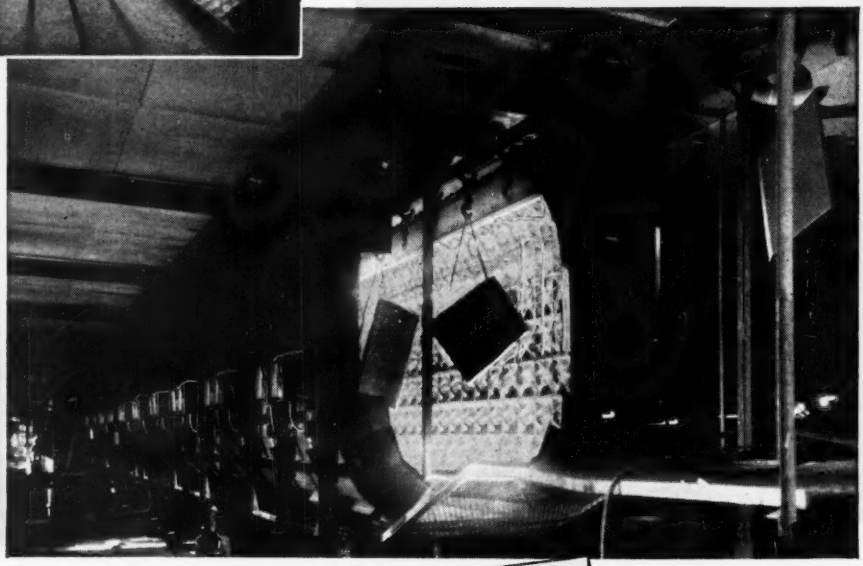

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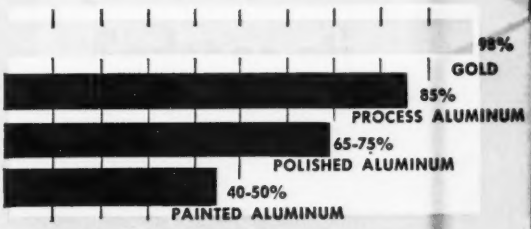

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pf editorial

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Conveyorize For Profit!

Although the employment of conveyors of various kinds in manufacturing and finishing processes has become second nature to process engineers, not all the benefits to be gained from their use are realized.

Conveyors adapt themselves particularly well to finishing processes—as witness the many types of conveyors which have been developed and used in such processes.

Conveyors start to work for their employers even before they are installed, because, through the use of conveyors, the rate of production can be determined—to a degree—in advance, thus making possible the establishment of a firm production plan. Parts in process move at a uniform rate through all steps in the process, rather than in job lots.

Overhead conveyors utilize normally unused space, making possible a more compact operation, and a neater, cleaner, and safer shop. They can also perform drying or cooling functions, eliminating the need for floor space for such operations. Overhead conveyors are widely used for in-plant, in-process storage, again saving floor space.

Conveyors such as those employed in automatic or semi-automatic plating machines make possible the most efficient use of plating plant floor space thus far found to be possible, as well as eliminating much of the hard work of lifting plating racks from tank to tank.

Conveyors of various kinds have made paint finishing an automatic process, since the product may be phosphatized, dried, sprayed with automatic spray equipment, baked, and cooled without being removed from the conveyor.

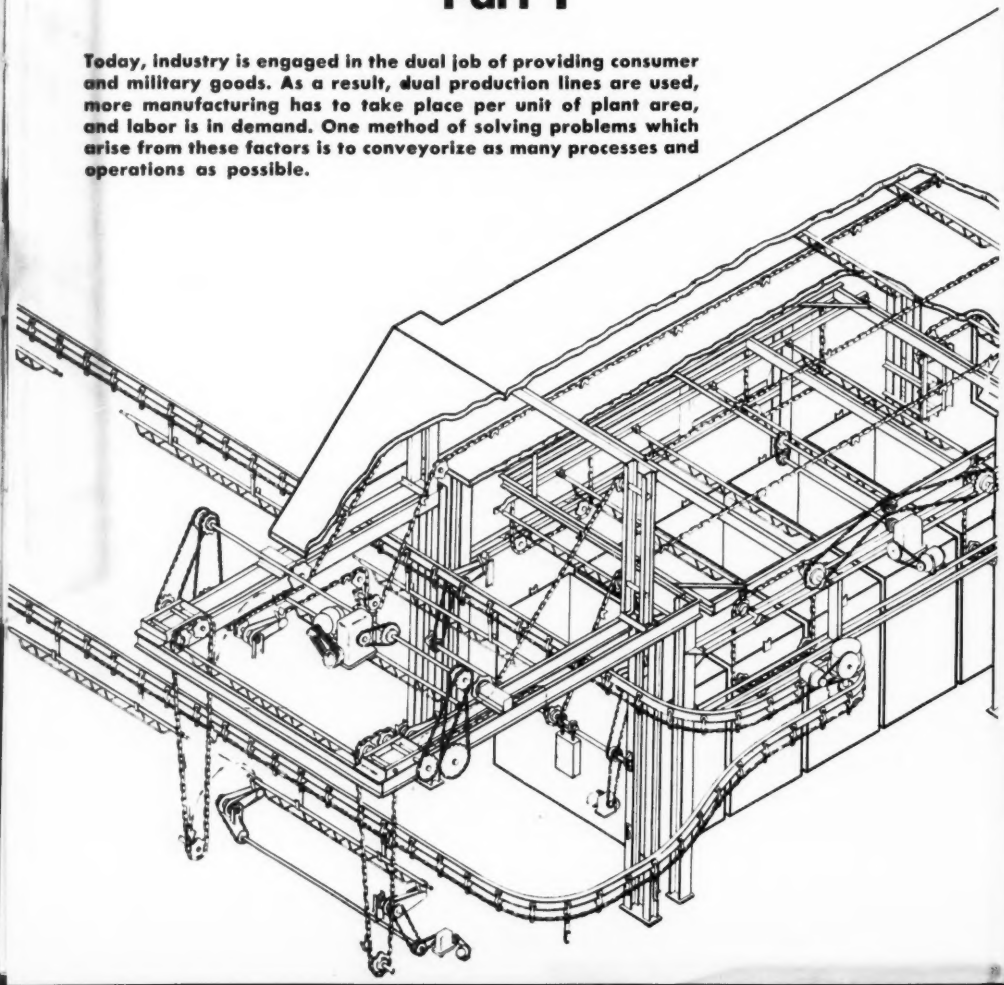
Conveyors make it possible to coordinate production from different departments so that the end product flows smoothly through the plant. Attention is focused immediately on bottlenecks resulting from unforeseen difficulties, and these can be quickly corrected.

Conveyors make possible a degree of process control and provide the basis for controlled quality of finish. They are, in reality, some of our most useful production tools.

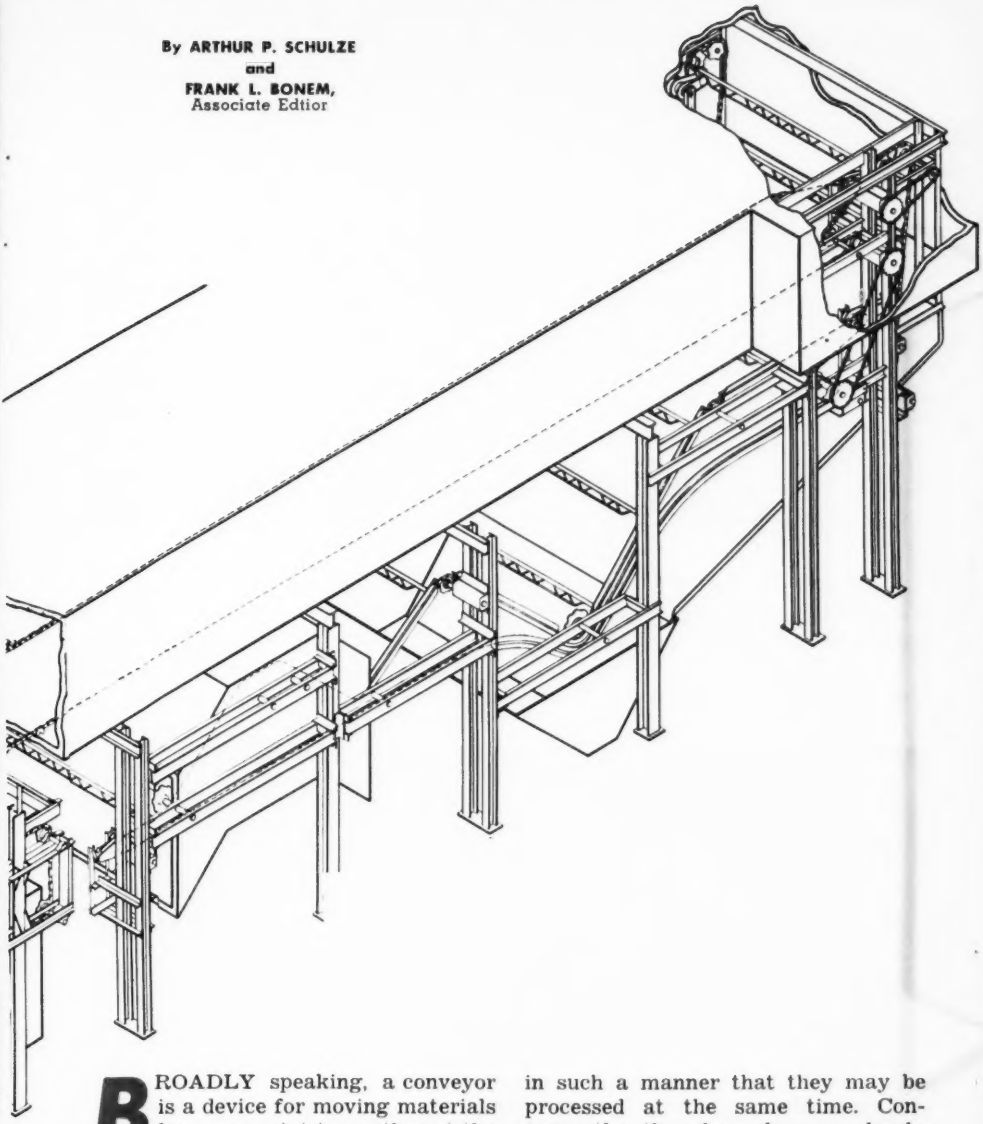
Conveyor Applications in the Finishing Industry

Part I

Today, industry is engaged in the dual job of providing consumer and military goods. As a result, dual production lines are used, more manufacturing has to take place per unit of plant area, and labor is in demand. One method of solving problems which arise from these factors is to conveyorize as many processes and operations as possible.



By ARTHUR P. SCHULZE
and
FRANK L. BONEM,
Associate Edtior



BROADLY speaking, a conveyor is a device for moving materials from one point to another at the same or different elevation. That was its first purpose and for many types of conveyors, it still is its only purpose. Other types of conveyors, however, can be used not only to transport materials, but also to move them in such a manner that they may be processed at the same time. Consequently, they have become closely interwoven with mass production.

When the "ice chain" was borrowed by the meat packing industry from its old job of moving ice buckets and adapted to the slaughter house, the conveyor was on its way to the im-

portant place it now occupies in industry. Henry Ford, while visiting a packing plant, observed beef being transported and processed on the overhead conveyor and promptly applied the two functions, transporting and processing, to the manufacturing of automobiles. Developments from then on were rapid and are a matter of common knowledge.

It has been stated that "the cheapest way to handle materials is not to handle them"; the next best thing is to use a conveyor. Since material handling forms the backbone of many manufacturing and finishing processes, being literally the veins and arteries through which industry pumps its products in a plant, it may not be out of place to briefly review, at this point, the basic underlying axioms of material handling.

Principles of Material Handling

The object of any conveyorized operation is to reduce operating cost and increase productive capacity; in broad terms—to raise economy and efficiency—the goal of any industrial process.

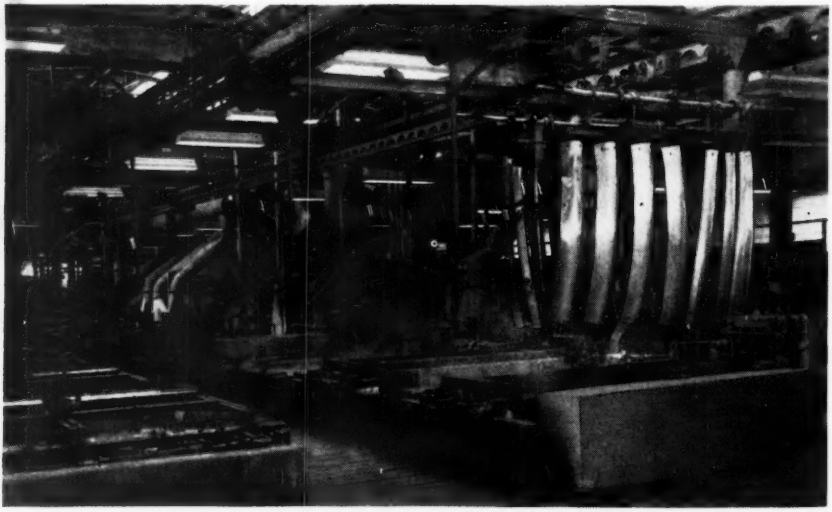
Whether a new plant is being planned, a new process incorporated in an old plant, or an old plant being modernized, certain principles should be followed and some specific factors borne in mind while the project is still in the planning stage.

The six commandments of material handling might be stated to be:[1]

1. Savings in travel distance.
2. Increased speed.
3. Elimination of handling operations.
4. Mechanical handling wherever possible.
5. Avoidance of unnecessary duplication of investment in material handling.
6. Coordination of interdepartmental handling.

[1] For a detailed discussion, see "Industrial Management," by Knowles & Thomas.

Fig. 1—A rack of bumpers is conveyed through a plating cycle by means of a hoist combined with a tramrail conveyor. (*PRODUCTS FINISHING Staff Photo*)



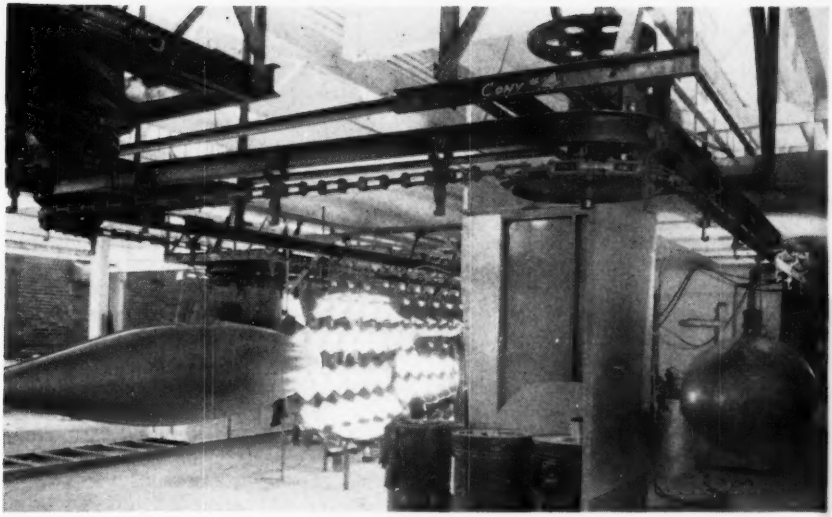


Fig. 2—View of an overhead 4-inch pitch, drop-forged rivetless chain, 4-inch I-beam conveyor, used during World War II for spray finishing airplane fuel tanks. Speed of the conveyor is 6.25-8.35 f.p.m.; trolleys are on 15-inch centers; loads at 14-foot centers; power—½ h.p. motor per conveyor.

(Photo courtesy Lamson Corp., Syracuse, N. Y.)

Once it has been decided that a conveyor of some kind is the answer to the material handling problem, certain other factors should be taken into consideration: (1) Are the materials to be moved small, large, heavy, or light? Can they be carried in baskets, on racks, on one hook or two? (2) Can the product handled pass through extreme heat or cold, vapor or liquid? Will its surface finish be critical so that the object must be suspended, or can it be moved on a roller conveyor? (3) How fast or slow must the conveyor move to comply with processing requirements? What must be its spacing or load-carrying capacity to meet production requirements at that speed? (4) Can the part be routed overhead or should it be moved on the floor? (5) What amperage will the motors draw at what loads? Is the power available? (6) Are roof trusses strong enough or must they be reinforced? Will it be more economical to operate a system of two conveyors of shorter length, or one long one?

Still other points that may influence the type of conveyor are: equipment maintenance, labor available, lost time and productivity due to change-over of handling methods. In many cases three tools can be used to answer or shed considerable light on these points: time study, motion study, and statistical quality control.

When these factors are applied specifically to the metal finishing industry, certain limitations in the type of equipment that can be used immediately become apparent. Obviously, a screw conveyor could not be used in moving castings through a plating tank, nor could a belt conveyor be used for a porcelain enamel furnace.

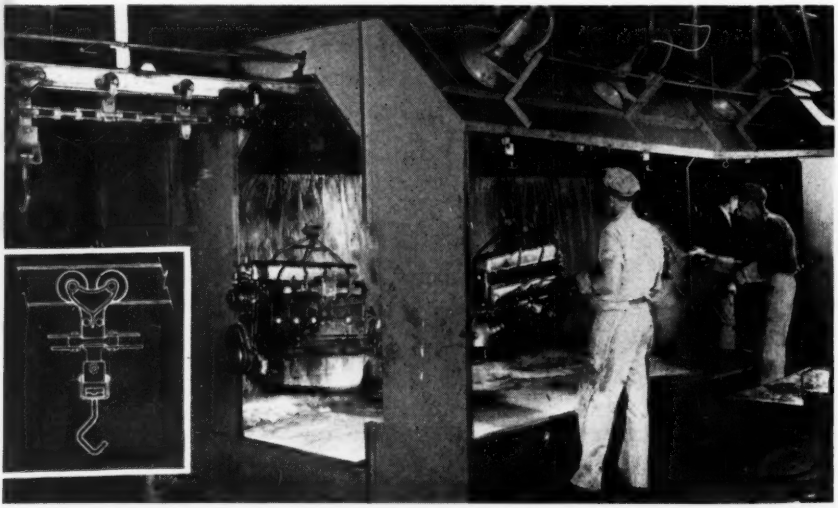
However, such processes as painting, polishing, buffing, electroplating, pickling, cleaning, and porcelain enameling have been conveyorized with great success. In fact, certain metal treatments, such as degreasing with trichlorethylene for example, are made easier and safer through the use of conveyors. Also applicable in many operations of a finishing department is the traveling hoist on a monorail system. Although conveyors may be classified in a number of ways, they shall be grouped, for the purpose of this discussion, in two large categories: chain conveyors—those systems that use some type of chain, and wire cloth and roller conveyors. A further break-down has been made into groups according to location—such as overhead and floor, and their usage for specific purposes.

Overhead Conveyors

Probably the most versatile of all conveying equipment is the overhead conveyor. Able to make turns in any plane and capable of being installed at any elevation, it also has the inherent advantage of saving floor space. It can carry almost any load at desired speeds through ovens, washing installations, chemical treatment units, and dip tanks.

The simplest of all overhead conveyors merely consists of a track upon which a trolley rides. Still rails, as these tracks without a drive are called, can be engineered as a complete system in itself or in conjunction with a regular "live" track system. The product, hanging from the trolley, is moved by hand when and where desired. With a well planned track layout and the necessary switches, the system has its greatest point in being versatile to a degree not achieved by any other conveyor system. It is, therefore, ideally suited to the job shop where products and rate of production may vary over a wide range. Its versatility is also its drawback, for no processing

Fig. 3—Automotive motors are spray painted while suspended from a four-wheel trolley on an I-beam conveyor. Swivel hooks allow the operator to turn the work at will.
(Photo courtesy Anchor Steel and Conveyor Co., Dearborn, Mich.)



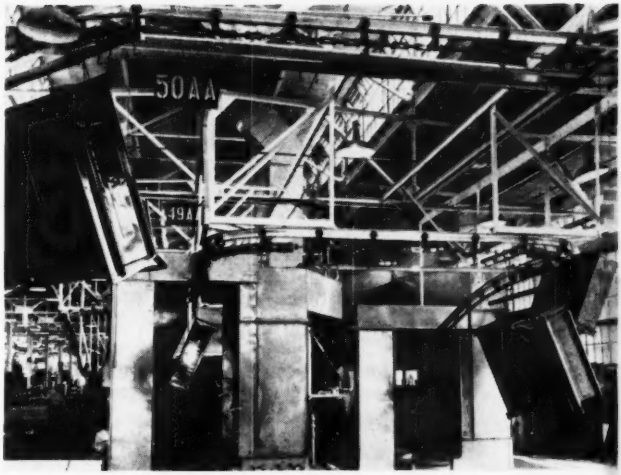


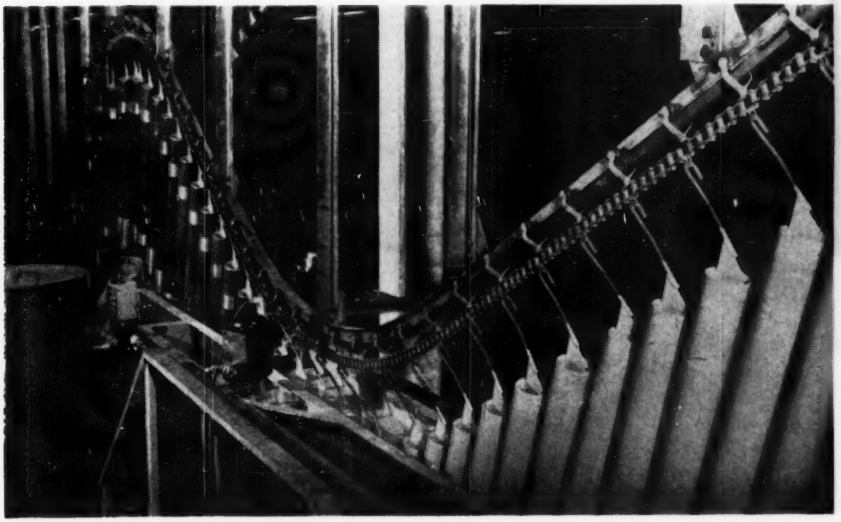
Fig. 4 — Adjustable loading bars are used to support "pick-up truck" bodies at the G.M.C. Truck & Coach Division. *(Photo courtesy Anchor Steel and Conveyor Co., Dearborn, Mich.)*

●

can be done while parts are moved on the conveyor. It can only be used for transporting or temporarily storing a product.

Closely allied to this system is the hoist, traveling on one or more I beams or rails. Although not a conveyor in the true sense of the word, it can and is used as such (see Fig. 1). Hoists, or cranes, are available in any capacity or type of mounting, and are adaptable to any power system. They can be operated by hand chain or electric

Fig. 5—The standard roller chain, by being turned on end, is capable of carrying large loads. Castings weighing 110 pounds pass through a paint dip tank in the plant of Koppers Company. *(Photo courtesy Jensen Specialties, Inc., Detroit, Mich.)*



motor, and moved anywhere along its track by hand or power. Special design features such as overhead turntables, rubber wheeled drives, and special switches make them adaptable to many different operations.

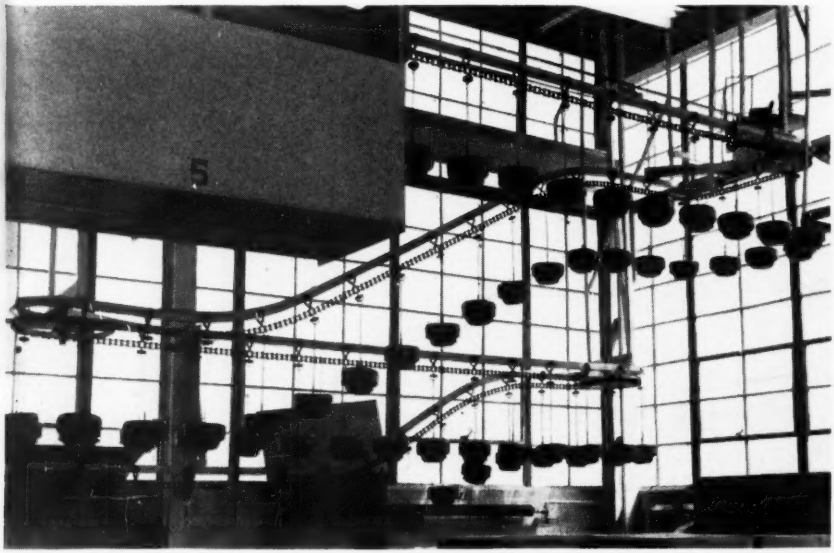
Hoists can be incorporated in elaborate conveyor systems as will be illustrated later or, conveyors have been designed to lower and raise, by hoists, sections of the conveyor as products pass over or through tanks or other installations.

Monorail I-Beam Conveyors

The most common conveyor seen in industry today is the Monorail I-Beam Conveyor. As is the case for many other types of conveyors, standard units are designed for any given load-carrying capacity. However, it should be pointed out that while almost all conveyors are standardized to a certain extent, the system installed in each plant is designed specifically to meet the requirements of that plant. In other words, each conveyor installation is "tailor-made."

In its simplest form, the monorail conveyor consists of an I beam, trolleys which ride the lower flange of the beam and from which products are suspended, a chain which links the trolleys and transmits the motivating force and, of course, a power unit which usually consists of a motor, gear, worm, or variable width pulley speed reducer and the driving sprocket. Somewhere between the motor and the drive sprocket a shear pin is usually incorporated in the drive. This safety feature prevents damage to the parts of the conveyor in case of jam-up. At least one idler sprocket is usually necessary in any one system; its mounting incorporates a worm and

Fig. 6—At the Industrial Wire Cloth Corp., Wayne, Mich., an efficient conveyor system coordinates transportation with automatic spraying and baking of automotive parts. By employing different operation levels, the 191-foot conveyor was fitted into a space 70 feet by 10 feet.
(Photo courtesy Jensen Specialties, Inc., Detroit, Mich.)



nut pair for taking up the slack in the chain. Idlers are also used for making turns in the horizontal plane; however, horizontal turns may also be made by causing the chain to follow a semi-circular track. In the latter case, the chain moves against a series of rollers, thus substituting rolling friction for sliding friction and thereby saving considerable power (see Fig. 2). Trolley design varies with the manufacturer and for the job for which they were intended. For the I-bean conveyors, at least two wheels are necessary. When loads to be conveyed are heavy, as for example an automobile engine (see Fig. 3), the trolleys from which the loads are suspended have four wheels; all the others have two. In other cases heavy loads may be carried by using two trolleys, one link apart, and connecting them by bolting the flange of the hook to both trolleys. The non-load-carrying trolleys are spaced at regular intervals as on other chains. The advantage of this method of loading is that only one type of trolley is used, thus simplifying not only maintenance but also inventory.

The lower frames of the trolleys fit through the chain links and various attachments may be bolted to it. Lugs bent into a U shape are very common since racks of all sorts can thus be attached to it (see Fig. 2). When it is desirable to turn the article being conveyed, swivel hooks can be mounted on the trolleys. When automatic rotation is applicable, a turntable coupling may be used between trolley frame and rack, and cylinders or rollers mounted on the supporting rod. Small belt pulleys are then placed where rotation is desired along the conveyor track, at the elevation of cylinders or rollers. Friction of belt against cylinder will cause the cylinder and the rack to turn. To facilitate the handling of long and/or large pieces, load bars may be used (see Fig. 4). These load bars may be made to order

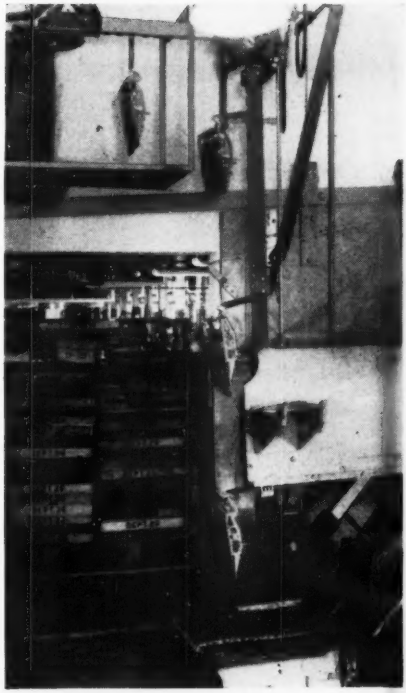


Fig. 7—Bases of typewriters are transported and painted by use of a lightweight Chain-O-Flex Conveyor.
(Photo courtesy Chain-O-Flex Corp., Franklin Park, Ill.)

or may be adjustable in length and for various trolley center distances. Other attachments may take various forms, sizes, and shapes to handle specific articles and can readily be made from bar stock or angle iron.

One of the most popular types of chain for this conveyor is the drop-forged rivetless chain (Fig. 2). Available from most conveyor manufacturers, the pitch[2] may vary from 2 to 6 inches; the material from malleable iron to stainless steel; and the chain

[2] Pitch of a conveyor chain is the distance from the joint of one link to the other joint of that link.

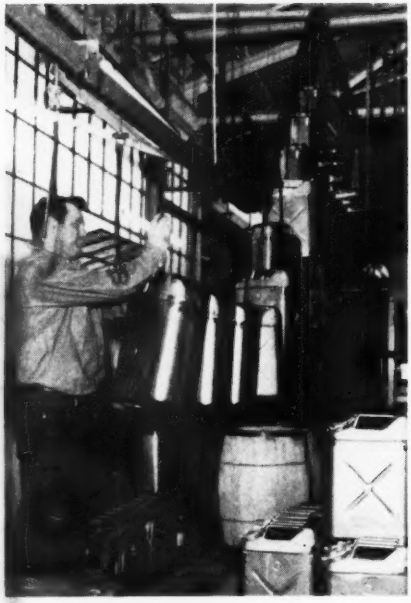


Fig. 8—An assembled Blitz can is hung on the Richards-Wilcox finishing conveyor in the Conco Engineering Works plant.
(PRODUCTS FINISHING Staff Photo)

may or may not be heat treated, depending upon the application for which the conveyor is intended. It has the inherent advantage of being able to be assembled and disassembled without any tools. The chain cannot, however, be used for driving purposes.

Not all overhead monorail conveyors use the drop-forged chain, nor is the drop-forged chain used only in overhead monorail applications. As will be discussed later, this chain, with larger pitches, is employed for drag-chain conveyors or apron conveyors.

Another type of chain, the standard roller chain, is illustrated in Fig. 5 where it is used to handle 110-pound casings at the Koppers Co., Baltimore, Md. In the installation shown, a 320 foot chain is used; parts are carried at ¾-inch centers, and the total load—over 22 tons—is pulled by a 1 h. p. motor. The same type chain is illustrated in Fig. 6 where, also, the compactness of this finishing system is very well illustrated. The whole finishing system was fitted into a floor space of 70 by 10 feet.

Some of the characteristics of this conveyor are: pitch—1⅝ inches; chain steel and malleable iron; idlers— 12 or 18 inches at the turns; self-lubricating; no take-up is required. Trolley wheels for these conveyors vary with the temperature for which they are intended. For extremely high temperatures, carbon wheels are employed.

Lightweight Overhead Conveyors

For lighter loads small pitch chain conveyors or special "lightweight" conveyors should be used. Some of the latter conveyors do not use the familiar trolley and I-beam combination but depend upon light chains controlled by chain-pulleys, cables, or other means to transmit movement and provide load-carrying attachments.

One comparatively new development is "Chain-O-Flex," a chain-type conveyor made by the Industrial Equipment Company, Chicago. This conveyor consists of a link chain moving in a steel tube (Fig. 7). The horizontal links slide on the inside, lubricated surfaces of the slotted tube flanges while the vertical links carry the loads with welded hooks. The conveyor is made in standard units and can easily be installed. It is designed for maximum flexibility (horizontal corners: 20 deg. to 180 deg.; vertical corners: 0 deg. to 128 deg.), and can carry up to 30 lb./ft. for systems up to 350 feet long with one drive and a spacing of parts at six-inch centers. Greater load-carrying capacity, of course, can be achieved with spacer bars, in which case the load is distributed over several hooks.

The R-W "Zig-Zag" conveyor, made by the Richards-Wilcox Manufactur-

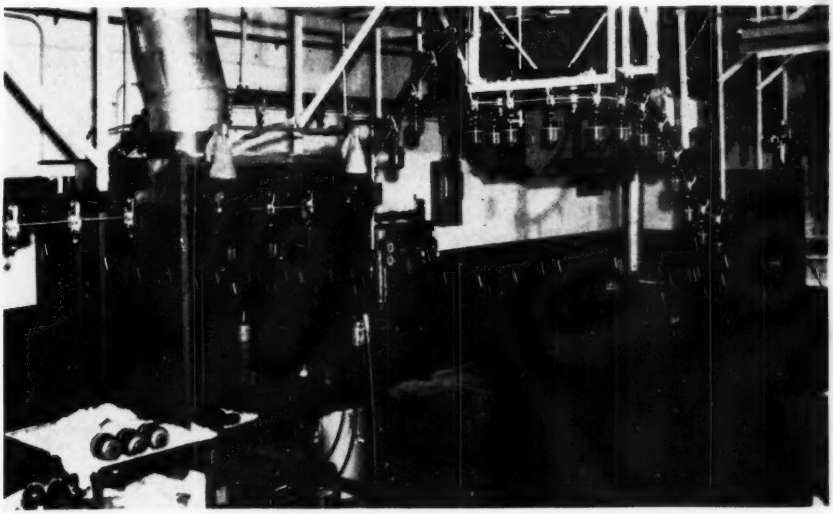
ing Co., Aurora, Ill., features a track which consists of a rectangular tube slotted at the bottom (Fig. 8). However, each link of the chain which moves through this tube has an attached roller. These rollers are located alternately in the horizontal and vertical plane, thus permitting great flexibility and small radii of curvature in these planes.

Loads are carried from various types of load pendants which are attached to the vertical wheel units. Standard sections of small radii curves and straight lengths of this small conveyor (inside dimensions of track: 1¾ by 2¼-inch; wall thickness, 3/16-inch) are ready-made. Easy and multiple methods of installations, low power requirements, and synchro drive units are some of the other characteristics of the Zig-Zag conveyor.

A third type of lightweight conveyor is illustrated by the Buschman Universal Cable Conveyor (see Fig. 9). In the installation shown, the small motors travel by means of a cable conveyor through a ceiling type infra-red oven, circle down through a spray booth, and then make another pass through the oven. By mounting the drying oven below the ceiling, considerable floor space is saved and ceiling area that would otherwise be of no particular function is put to use. This type of automatic equipment mounting, below the ceiling or above some other unit, is rapidly coming into increased usage and marks a definite and significant trend.

The adoption of the lead-screw principle has led to another type of overhead conveyor. Called the Teleflex Conveyor, it consists of a flexible screw cable, with an exterior thread, which revolves within a Y-shaped rail. The conveyor is driven at one end by a small electric motor, the power being transmitted through a reduction unit and couplings. It may be installed

Fig. 9—A Buschman Universal Cable Conveyor serves two spray booths and a bake oven in finishing hydraulic damp motors in the Minneapolis-Honeywell Regulator Company plant. *(Photo courtesy E. W. Buschman Co., Inc., Cincinnati, Ohio)*



as an open or closed system, depending upon plant layout. Loads are suspended from removable hooks which ride in the groove of the lead screw.

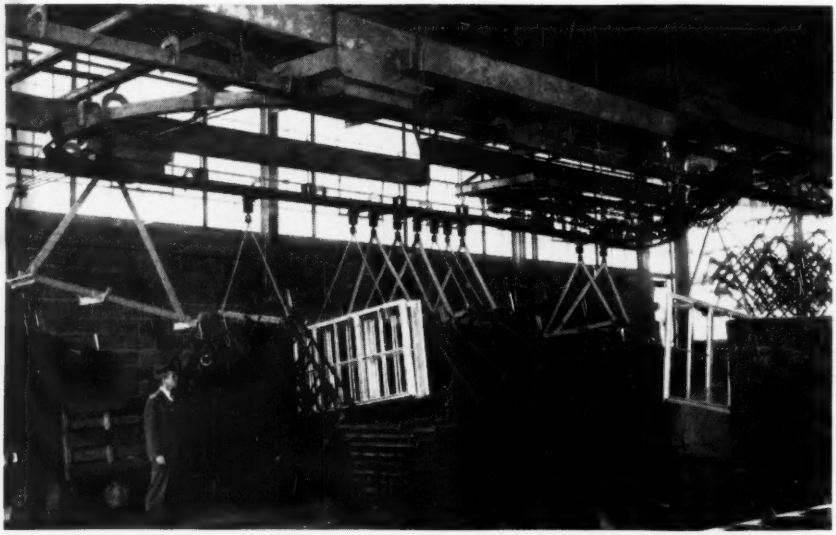
Many other types of lighweight conveyors are on the market today. For example, the Lightweight Conveyor Co., Detroit, Mich., offers a flexible monorail conveyor that may be erected and taken apart easily. Designed for relatively small, light parts, it may be operated as a bench, overhead, or portable conveyor system. No superstructure or handling equipment is required for installation of the conveyor. It is produced in a variety of standard rail length sections, curved dips, and so on. This conveyor system can be shortened, lengthened, or the route altered by adding, changing, or removing standard lengths and curves.

Another example that may be cited is the Chain-Veyor, produced by the Southern Engineering Co., Burbank, Calif. Extremely flexible, its short radius curves (radii - 15 inches) and track sections can be combined for quick changes. By joining various curves, any combination is possible. The system has a heavy-duty drive which uses a special sprocket to distribute chain stresses and also afford a straight line pull on the chain. The speed of the conveyor, which is adjustable while the conveyor is in motion, is from 3 f. p. m. to 9 f. p. m. Other features of this system are bronze universal joints at 3-inch intervals and Oilite bearings. To assure equal wheel loading regardless of the direction of the chain pull, load wheels are mounted at a 45 degree angle to the load pendant and at a 90 degree angle to each other.

Conveyor Systems

Various types of chains, as shall be discussed to a further extent in the

Fig. 10—From manufacturing jigs, frames are loaded into carriers, pushed on the "free" line to the "power" line, and picked up by pusher lugs on the drive chain. Pusher lugs are spaced at 5-foot 4-inch centers in this installation.
(Photo courtesy Jervis B. Webb Co., Detroit, Mich.)



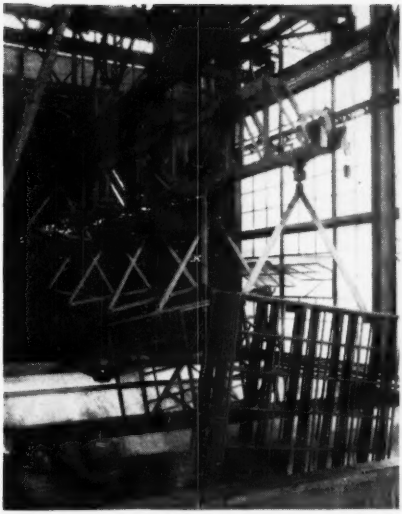


Fig. 11—A five-load walking beam is hydraulically raised and lowered, each load advancing from one tank to the next in a cycle. Note automatic stops which keep the load carriers locked in position while the beam is lowered and raised.
(Photo courtesy Jervis B. Webb Co., Detroit, Mich.)

second part of this article, not only are basic design features in overhead conveyors but can also be used for floor and/or drag chain conveyors, single or multiple strand pallet or apron conveyors, and to tie systems of conveyors into one integral unit.

Such combinations of conveyor systems can be synchronized through electrical or mechanical means. In the former, various types of electrical servomechanisms, often called synchros, are employed to coordinate the timing and speed of various conveyor motors. In other words, these units when electrically interconnected, form an electric line shaft through which any motion of one unit will be simultaneously reproduced by the other. The various motors can be controlled from one master panel and a wide range of speeds can be maintained in the various units that are in register. It is also possible to change all conveyor speeds simultaneously and to control the r. p. m. of each unit accurately. In the mechanical system one motor may be used to drive two or more conveyors through a combination of line shafts, worm gears, bevel gears, and sprockets and chains. Thus, the speed of one conveyor can be controlled in relation to any other conveyor. The whole system's speed may be controlled through a speed adjusting unit located between the motor and the prime transmission unit. However, this system is not as flexible in regard to control of relative speeds of one conveyor to another as the electrical systems.

Many examples of combination conveyor systems are available which illustrate conveyor synchronization and the various ingenious devices available for complete automatic control of a

Fig. 12—A view of the paint lift showing how a single carrier is raised and lowered into the paint dip tank. Note how the conveyor chain bypasses the track, thus leaving the dip section of the track "free."
(Photo courtesy Jervis B. Webb Co., Detroit, Mich.)

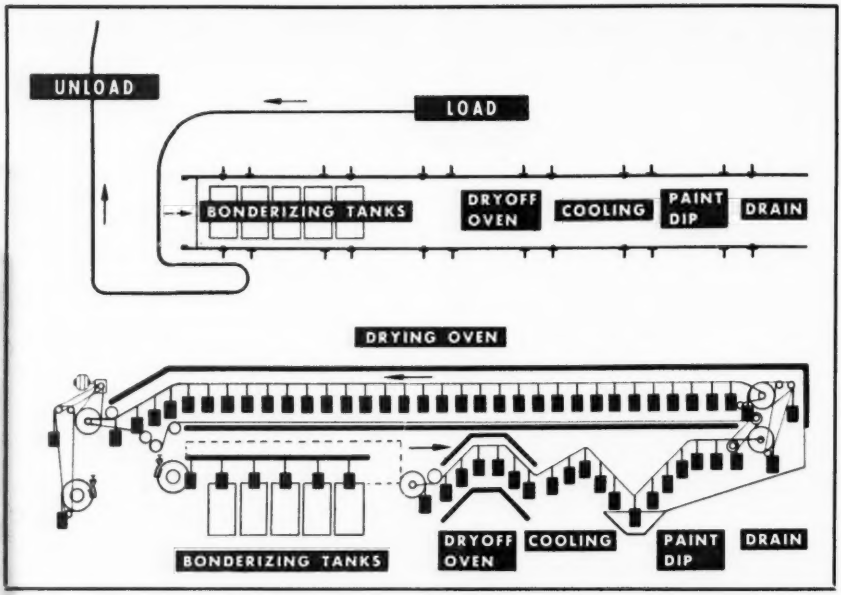


Fig. 13—Schematic drawing of a conveyor system which combines a monorail and double-strand roller chain conveyor.
(Drawing courtesy Anchor Steel and Conveyor Co., Dearborn, Mich.)

process. Such a conveyor system was designed and installed in the plant of the Michael Flynn Manufacturing Co., Philadelphia, Pa., manufacturer of steel doors, sash, and skylights. In this system "free" and "power" conveyors, together with switches and lowering sections, are combined to give live storage space, versatility to production rate, and high efficiency in overall production.

To combine a "free" and "power" system, the conveyor is of the pusher type; that is, lugs on the conveyor chain push the load carrying trolleys, which ride in a frame. By disengaging the trolley from the pusher lug, loads may be stopped anywhere along the line.

Empty carriers on the "free" line are first loaded from assembly jigs (see Fig. 10). Loads are pushed manually to a 10-foot long sloped section and automatically fed into the "power" chain conveyor which elevates the work carriers to a high level and discharges them to a five-load walking beam hydraulically-operated lowering section. Located over phosphatizing tanks which are set in 8-foot pits (Fig. 11), loads of sash up to 1,000 pounds each are immersed on each processing cycle into the five-tank unit containing the cleaning, phosphate coating, and rinsing solutions.

Each time the section is at the top position, a load is ejected, and another load enters by the forward motion of the "power" chain. The large lift is suspended by two strands of No. 468 chain, with a third strand acting as a counterweight.

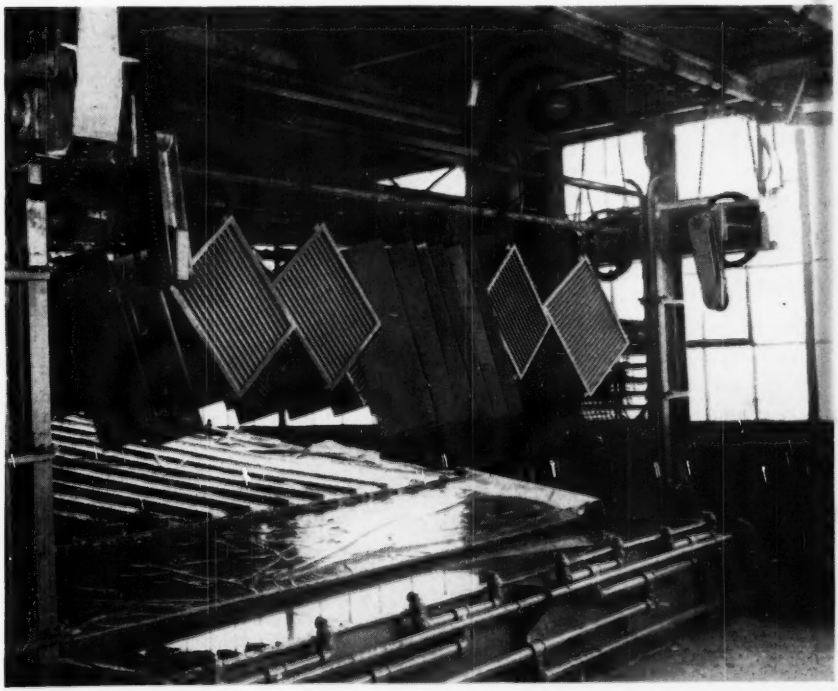
Following the phosphatizing treatment, workloads are again picked up

by the "power" line and moved forward, intermittently, through the air dry-off section. On each forward motion of the "power and free" system, a load is discharged into the paint-tank-lowering section. Figure 12 shows the paint lift, hydraulically-operated from a 30 h. p. central pump, which carries one loaded carrier at a time. Loads move off the lift, over the "power and free" section, then around to the drying oven. Capacity of the system is about 36 loads per hour.

Transportation through the finishing area is coordinated and controlled conveniently from a central point. The system incorporates electrical controls, limit switches, and relays for automatic operation. One operator supervises the entire area, checking phosphatizing tanks, conveyor, paint, and so forth.

Further highlighting this streamlined handling system is its "hairpin" section of 4-inch "free" rail with several switch crossovers. Often heavily loaded, it serves for cooling and "live" storage of product while en route to the shipping area. Many other examples are available where two or more different types of conveyors are combined and form, together with various types of mechanical devices such as work hanger bars, transfer arms, multi-transfer devices, a

Fig. 14—An example of a typical transfer point. The load bar is in position for the automatic paint dip, after which it will be transferred onto a double-strand roller chain conveyor for draining and baking.
(Photo courtesy Anchor Steel and Conveyor Co., Dearborn, Mich.)



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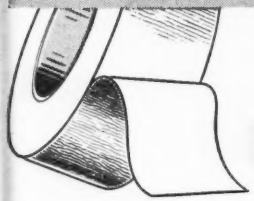

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INDUSTRIAL TAPE DIVISION
THE SEAMLESS RUBBER COMPANY
NEW HAVEN 3, CONN., U. S. A.

complete automatic conveying system. In these advanced installations one man can control the cleaning, drying, painting and baking — in short, the complete finishing process — from one location.

Figure 13 is a schematic drawing of one such "combination" system which was designed and installed by the Anchor Steel and Conveyor Co., Dearborn, Mich. In this system a standard monorail I-beam conveyor brings the products, carried on work hangers which are suspended by special hooks, from the manufacturing area to the phosphatizing tanks. Transfer arms then automatically remove work hanger bars from the overhead conveyor and deposit them on a multi-transfer or double-strand roller chain conveyor. This double-strand cross bar conveyor is the processing unit and is limited in its path of travel. It moves five work hanger bars progressively through the phosphatizing system consisting of five dip tanks.

Emerging from the last tank, work hanger bars are transferred to double-strand conveyors which are equipped with "V" shaped attachments. They take the work through the "dry-off" oven, the paint dip (Fig. 14) draining area, and the overhead drying oven. Coming out of the oven, the carrier parts are automatically transferred back to the monorail conveyor to be carried to the next step in the fabrication process.

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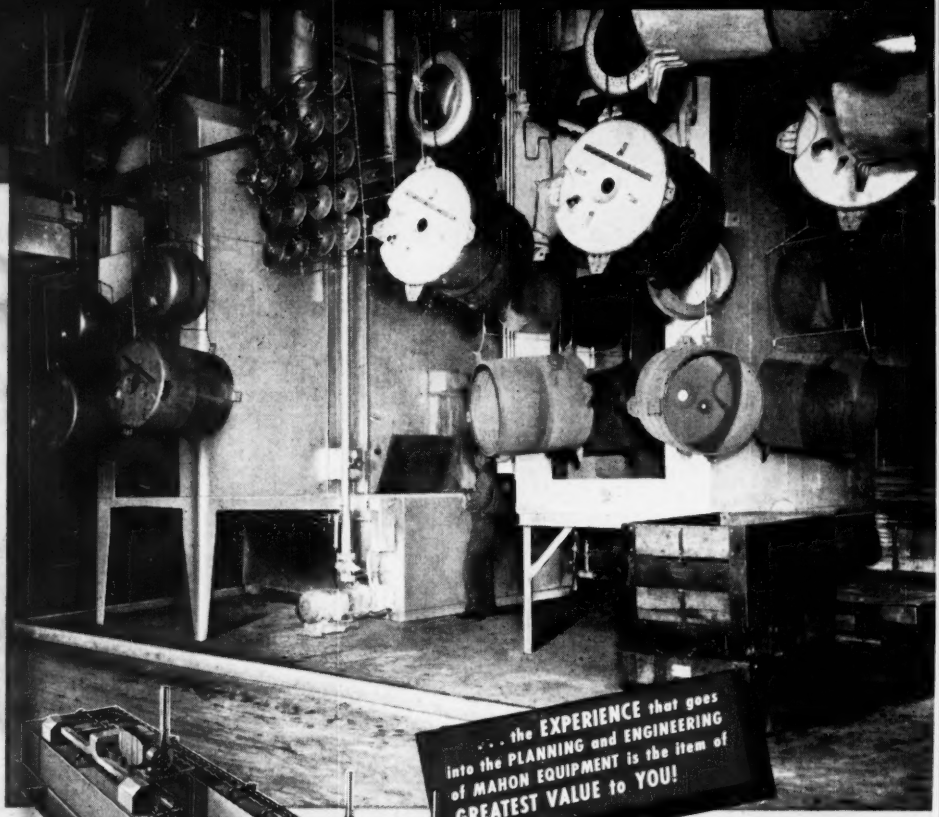
COMPLET



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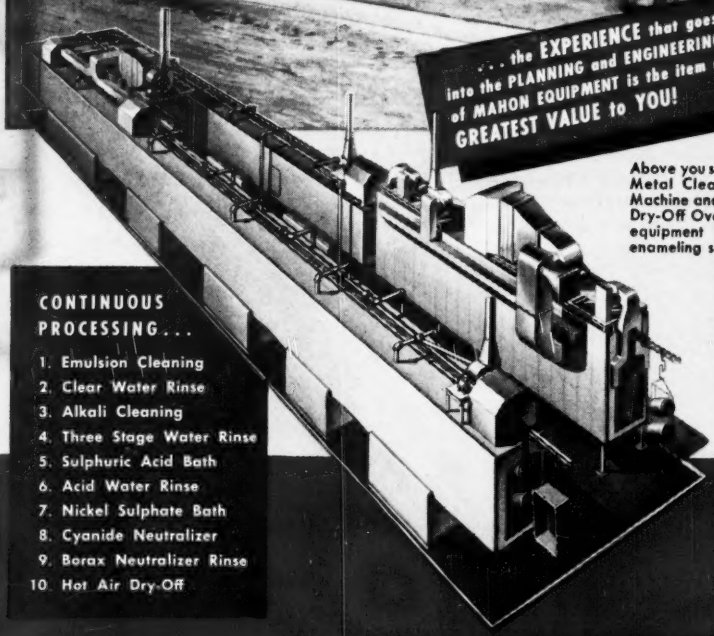

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1. Emulsion Cleaning
2. Clear Water Rinse
3. Alkali Cleaning
4. Three Stage Water Rinse
5. Sulphuric Acid Bath
6. Acid Water Rinse
7. Nickel Sulphate Bath
8. Cyanide Neutralizer
9. Borax Neutralizer Rinse
10. Hot Air Dry-Off

Above you see parts entering the Mahon Metal Cleaning and Spray Pickling Machine and emerging from the Hot Air Dry-Off Oven in the Maytag plant. This equipment is part of the porcelain enameling system. At left is an illustration showing the complete Mahon Metal Cleaning and Spray Pickling Machine together with the Dry-Off Oven. The Cleaning and Pickling Machine is sealed throughout its entire length by means of a Hydro-Hermetic Seal which protects the conveyor from corrosive fumes.

M

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Finishing

SYSTEMS

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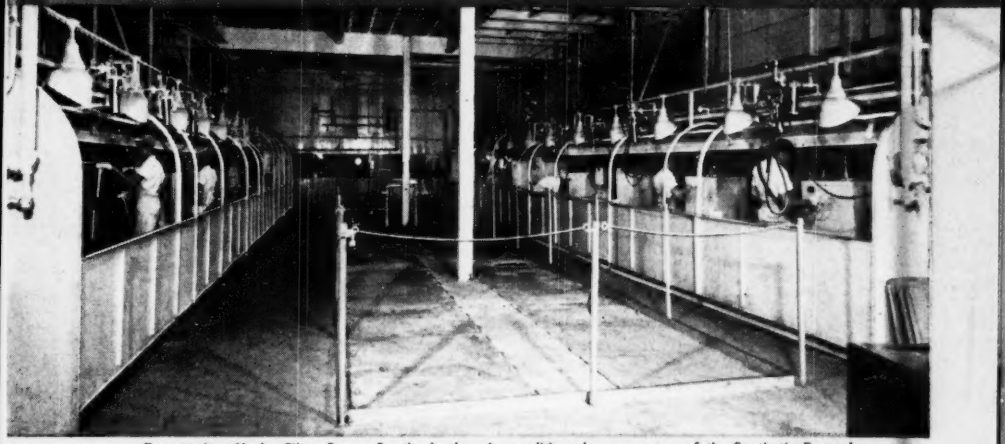

Two Mahon Hydro-Filter Spray Booths in the air conditioned spray room of the Synthetic Enamel Finishing System at Maytag. Note Diffusers of the Filtered Air Supply System in the ceiling.

Modern MAHON FINISHING EQUIPMENT in the MAYTAG PLANT produces FINER FINISH!

The famous Maytag Appliances receive their fine lustrous finishes in Mahon Finishing Systems. In the modern Maytag plant at Newton, Iowa, there are two complete Mahon Finishing Systems—one for synthetic enamel, and one for porcelain enamel finishing. Both systems are of the Mahon "Self-Housed" type, and are models of efficiency in modern production finishing. If you are in need of a complete finishing system for either synthetic or porcelain enamel, lacquer, paint or varnish, you, like other manufacturers, will find Mahon engineers better qualified to advise you and to do your planning. Regardless of whether you require a complete new system or an individual unit of equipment, you can turn your problem over to Mahon with complete confidence, because the Mahon organization has pioneered development in this highly specialized field for over thirty years . . . the experience of planning, engineering, building and installing thousands of finishing systems for every conceivable product in virtually every industry where finishing constitutes a major production operation, has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mech. Ind. File for information, or write for Catalog No. A-652.

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AHON

Preparation and Maintenance of Copper and Zinc Plating Baths Using Substitute Methods

By MYRON B. DIGGIN
Technical Director, Hanson-Van Winkle-Munning Company
Matawan, New Jersey

IN making conversions from one type of plating bath to another, the plater has been confronted with serious shortages in anodes and chemicals. It happens very frequently that the plater will have anodes available but may lack the conventional metal salt with which to prepare the bath. The supply situation is also variable; this month one type of salt can be obtained, next month it may be scarce.

Copper Solutions

For years, cyanide copper plating solutions have been prepared by using copper cyanide as the metal salt. During the past several months this salt has been in short supply, making it necessary to use substitute materials. In the early days of electroplating, copper carbonate was used widely for preparing copper plating baths. Basic copper carbonate, at times, is available in limited quantities. It reacts in the following manner to form the double cupro-cyanide salt:

$$CuCO_3.Cu(OH)_2 + 6KCN + Na_2SO_3 \rightarrow 2K_2Cu(CN)_3 + Na_2SO_4 + K_2CO_3 + H_2O$$

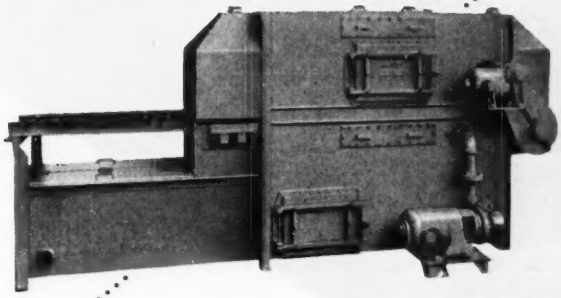
Sodium sulfite is added to reduce the copper from the cupric to the cuprous condition. If it is not added, cyanogen will be formed which is not only poisonous, but also causes a loss of cyanide. Baths can be made without the reducing agent but it will be found more expensive to use sodium or potassium cyanide for the reduction instead of the cheaper sulfite salt. The main objection to preparing copper solutions with copper carbonate is the formation of either sodium or potassium carbonate as an end product. In some of the high speed, bright solutions the amount of carbonate formed in preparing a solution from basic carbonate of copper is close to the limit of good operation. After the bath has been in operation only a short time, it is necessary to reduce the carbonate concentration with a lime treatment.

The proportions of chemicals required for the preparation of copper solutions are based upon a copper content of basic copper carbonate of 57.3 per cent. Typical formulae are as follows:

High Speed Bright Copper

Copper carbonate*	14.0 oz./gal
Sodium sulfite (anhydrous)	8.0 "
Potassium cyanide	26.2 "
Potassium hydroxide	5.0 "

each A-F washing machine...



*This A-F Machine was built *specifically* for removing cyanide from hardened gears... quickly, efficiently, economically!

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Addition Agent	0.5 oz./gal

*This will result in a potassium carbonate content of 8.75 oz./gal.

Conventional Sodium Cyanide Bath

Copper carbonate	3.7 oz./gal
Sodium cyanide	6.1 "
Sodium sulfite (anhydrous)	2.1 "

Other Baths

Use 0.6 pound of sodium sulfite (anh.) for each pound of copper carbonate required.

In preparing baths containing copper carbonate, it is suggested that the alkali cyanide and sodium sulfite be dissolved in an amount of water equal to about one-half the final solution volume. Add alkali hydroxide as required, then slowly add the basic copper carbonate with stirring. At no time should the solution be heated above 115 to 120 deg. F.; otherwise insoluble black copper oxide may be formed. After the salts have been dissolved, dilute to normal volume.

Since copper carbonate may be less pure than plating grade copper cyanide, baths prepared with this material may require dummying at 3-5 amp. per sq. ft. before being used for production plating.

Sodium sulfite has, at times, been difficult to obtain. As a substitute reducing agent, anhydrous metabisulfite known as "ABS" can be used. For the past few months this salt has been more available than sodium sulfite. It is converted in solution to sodium sulfite by reacting with caustic soda (or caustic potash) as follows:

$$2\ NaOH + Na_2S_2O_5 \rightarrow 2Na_2SO_3 + H_2O$$

In preparing a bath from copper carbonate and ABS, use 0.8 lb. of ABS + 0.32 lb. of caustic soda (0.45 lb. caustic potash) to each pound of sodium sulfite called for in the paragraphs above. For preparing complete copper solutions with this salt, the following formulations are suggested:

High Speed Bright Copper

Copper carbonate*	14 oz. / gal.
ABS	6.4 "
Potassium hydroxide	8.6 "
Potassium cyanide	26.2 "
Addition agent	0.5 "

or as recommended

*This will give potassium carbonate content of 8.75 oz./gal.

Conventional Sodium Cynide Bath

Copper carbonate	3.7 oz./gal
ABS	1.65 "
Sodium hydroxide (caustic soda)	0.75 "
Sodium cyanide	6.1 "

Other Baths

Instead of 0.6 lb. of sodium sulfite (anh.) for each pound of copper carbonate required, use 0.48 lb. of ABS + 0.25 lb. of caustic soda.

In preparing baths with ABS add the required amount of sodium or potassium hydroxide (caustic soda or

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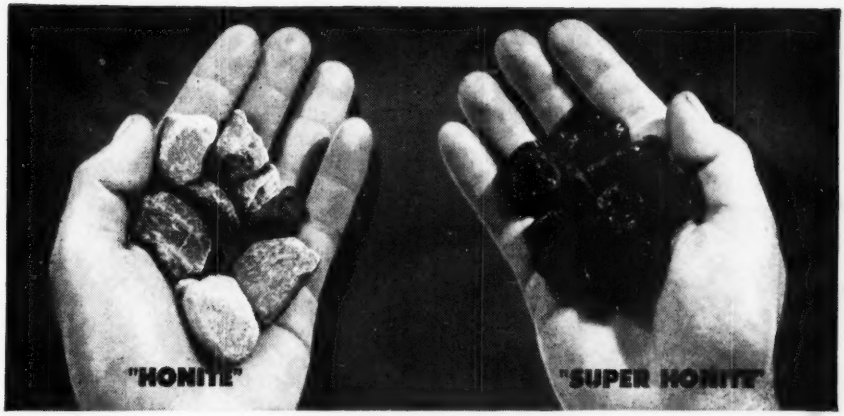

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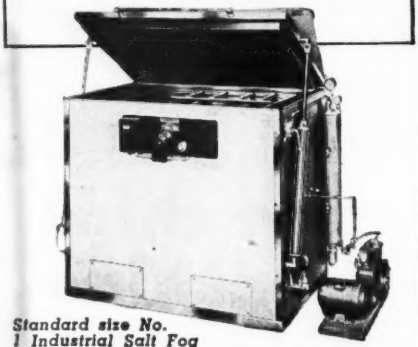

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Consider these features:

- Lucite nozzle with fixed orifice that does not corrode or clog.
- Rubber-lined box for protection against corrosion.
- Accurately controlled enclosed heating.
- Fully insulated for heat economy.
- Air by-pass valve to clear cabinet before inspection of specimen.
- Exhaust flange at rear.
- Air compressor with oil filter. (Cabinet can be connected to other air dryer.)
- Air-operated cover lifter (extra).

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potash) to the tank filled with one-quarter of its capacity of water. Next add the indicated amount of anhydrous sodium metabisulfite (ABS) and stir until the reaction ceases. Additional water may be added at this point. The full amount of sodium or potassium cyanide is added, and after it is dissolved, the copper carbonate is stirred in. The cyanide should not be mixed with sodium metabisulfite in any other order than that given above.

In recent months, many cyanide copper plating baths have been made with cuprous oxide. The following equations describe the reactions:

$$Cu_2O + 2KCN + H_2O \rightarrow 2CuCN + 2KOH$$

$$CuCN + 2KCN \rightarrow K_2Cu(CN)_3$$

It is evident from the equation that either potassium or sodium hydroxide results from the interaction of cuprous oxide and the alkali cyanide. For this reason, cuprous oxide is more advantageous in preparing baths of the high speed type rather than ordinary copper solutions, although it can be used for the latter if the pH is controlled.

To prepare a high speed solution using cuprous oxide, the following chemicals are required:

Cuprous oxide	9.25 oz./gal.
Potassium cyanide	27.0 oz./gal.
Addition agent	as required

No potassium hydroxide is required because the amount of oxide to yield the specified metal concentration will produce 6-7 oz./gal. of KOH in the solution.

A bath made from cuprous oxide is always prepared in a spare tank which should be larger or as large as the working tank. The required quantity of potassium hydroxide is dissolved in about one-half the volume of water finally required. The solution must be heated to at least 120-130 deg. F. This step is important because the oxide dissolves slowly if it is added to a cold solution, even though heat is applied

AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet

Subject: HOW TO MAKE PAINT STICK TO GALVANIZED IRON WITH LITHOFORM®

INTRODUCTION

"Lithoform" forms a dense, zinc phosphate coating on zinc, cadmium, and galvanized surfaces — including Galvanneal, cadmium plated steel, zinc plated steel, zinc base alloys, and zinc base die castings. The "Lithoform" coating, which is non-metallic and inactive, retards reaction between alkaline metal oxide and the paint film. Peeling and loss of adhesion are thus greatly retarded on painted Lithorized zinc and cadmium.

ADVANTAGES OF "LITHOFORM"

"Lithoform" forms a durable bond for paint. It is economical. It eliminates frequent repainting. It protects both the paint finish and the metal underneath. "Lithoform" meets these Government Finish Specifications:

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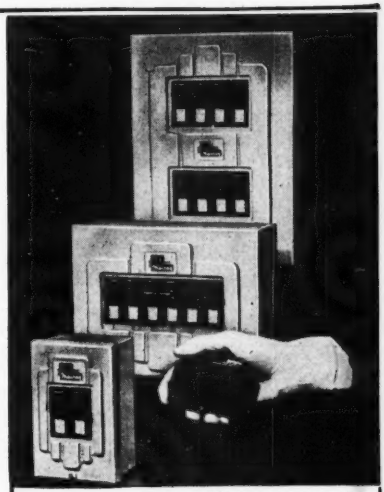

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Murray Circuit Protectors are fully magnetic and provide maximum protection for both domestic and industrial wiring. Housings are of galvanized iron which is Spray Lithorized for long paint life.

THE LITHORIZING PROCESS

"Lithoform" can be applied by brushing or spraying the work with simple hand equipment, by dipping it in tanks, or by spraying it in industrial power washers.

Brush. Galvanized bay windows, cornices, rain gutters, hardware, building siding, truck panels, and farm equipment are typical of the many surfaces that are treated effectively with Brush "Lithoform".

Dip. This grade is used for coating cleaned surfaces of such typical products as cabinets, refrigeration condensers, etc., immersed in heated solutions in tanks.

Spray. The spray process is the most logical one with which to coat sheets, coiled strip or duplicate products best processed on a conveyor.

CHEMICALS ACP PROCESSES

WRITE FOR FURTHER INFORMATION ON "LITHOFORM" AND ON YOUR OWN METAL PROTECTION PROBLEMS.

CHEMICALS ACP PROCESSES

later. The copper oxide is then added slowly, with constant stirring, to the heated solution. Violent agitation using mechanical stirrers will greatly decrease the time required to take the oxide into solution.

After all of the oxide has been added and thoroughly agitated, the volume is increased to its working capacity. If the spare tank is smaller than the working tank, use proportionate volumes and amounts of chemicals. The reaction is exothermic and the solution will heat as the oxide dissolves, finally reaching 180 deg. F. or higher. The solution should be agitated and kept at 180-190 deg. F. for at least 12 hours. This is necessary to ensure complete solution of the copper oxide.

Any solution made up in this manner should be given a thorough carbon treatment in the spare tank and an electrolytic purification at low current density after filtering to the plating tank.

Cuprous oxide cannot be added to the production solution for correcting either the free cyanide or metal content. In the first place, it is not desirable to put an insoluble material in a powered form into the production tank and secondly, the oxide will dissolve at an extremely low rate in the bath.

A conventional sodium copper cyanide bath can be made from the following formula:

Copper oxide	2.5 oz./gal
Sodium cyanide	6.5 "
Sodium carbonate	2.0 "

This will produce a copper content of around 2.1 oz./gal. and a free cyanide of 1.2 oz./gal. To prepare this solution, dissolve the required amount of sodium cyanide in water, using about one-half the final solution volume; slowly add the copper oxide while agitating the solution which has been previously heated to 120-130 deg F. Some baths have been prepared by stirring the oxide for a longer time in

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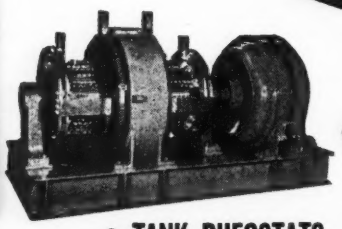

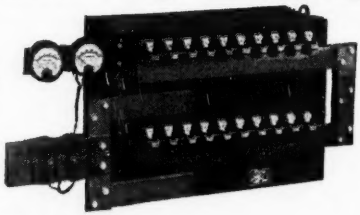

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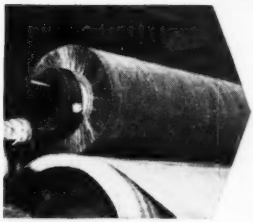
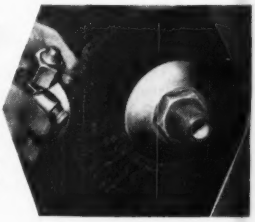
How Pittsburgh Brushes SPEED PRODUCTION



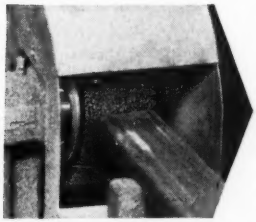
1. Removing oil film from steel!

Crown Cork & Seal Co., Inc., asked Pittsburgh engineers to recommend a brush suitable for washing oil film from steel before annealing. A "built-up" brush made of Tampico sections was installed. Oil and foreign matter were completely removed without harming the surface of the steel. Production showed an immediate increase, and time saved due to fewer brush replacements added to overall savings.

2. Satin-finishing brass fixtures!



Frequent breakdowns and brush changes hampered Bastian-Blessing Company's production of satin-finish parts for its products. Pittsburgh engineers recommended a crimped steel, standard 10" brush. Reports after three years' use show Pittsburgh Brushes have increased production, improved quality and saved materials . . . while lasting *three times longer* than previous brushes!



3. Removing burrs from steel!

Problem: The National Electric Company needed a brush to eliminate burrs and scale, yet the brush had to combine cleaning ability with long life. Solution: Pittsburgh designed a brush to specifications—a brush that was stiff and tough enough to penetrate, clean, and remove burrs and scale, and rugged enough to stand up. Result: an increase in efficiency; a jump in production!

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Pittsburgh's complete line of brushes of every type, for every purpose, will provide a practical and economical solution of any brush problem you might have. Drop us a line on your company letterhead for a copy of our new booklet that shows, through actual case histories, how Pittsburgh can help cut your brushing operation costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-6, 3221 Frederick Ave., Baltimore 29, Maryland.

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an unheated solution. The pH of the resulting solution will be higher than desirable for this type of bath. To reduce the pH, sodium bicarbonate can be used but it should be added slowly. This is a potentially dangerous operation since hydrocyanic acid gas will be evolved. The plating personnel should be acquainted with this fact. Adequate ventilation must be provided during this operation because the hazards involved are serious.

Commercial cuprous oxide will analyze approximately 86 per cent copper. Each pound of oxide will require 2.7 lb. of potassium cyanide to form the complex. It should be emphasized that no sulfite is necessary to reduce the copper in this instance or in any other case where the copper is in the monovalent form. Approximately 0.8 lb. of potassium hydroxide will be formed per pound of copper oxide dissolved on the basis of theory, but practical results show that the buildup is closer to 0.6 lb. of hydroxide per pound of copper oxide.

Other copper compounds that may occasionally be obtained as substitutes for copper cyanide are copper hydroxide (blue) and cupric oxide (black copper oxide). These two materials may be substituted for copper carbonate in the formulae given earlier in this section where 12.0 oz./gal. of copper hydroxide or 9.8 ounces of black copper oxide can be substituted for 14.0 oz./gal. of copper carbonate.

If no copper salts are available to use in preparing a cyanide plating solution, copper anodes can be dissolved electrolytically with or without periodic reverse current. The electrolytic method is particularly suited in making high speed copper solutions because a considerable amount of potassium hydroxide is formed in the solution because of low cathode efficiency.

Employing periodic reverse current, the following procedure has been used for building the copper content of the bath to approximately 5 oz./gal. Beyond this point the current efficiency falls off rapidly and other sources of copper, such as copper cyanide, copper carbonate and other substitutes for the cyanide must be used to supply the balance of the copper required. In preparing a high speed bath, the starting solution is made up to contain 26 oz./gal. of potassium cyanide. Half the anodes are placed on the positive bar and half on the negative bar. A current density of 80 asf. is used and the current reversed aproximately every thirty seconds. About 70 ampere-hours/gallon are required to build the copper content up to 5 oz./gal. An additional 35 ampere-hours/gallon brings the copper concentration up to only 6.0 oz./gal.; 35 ampere-hours more yield only another 0.5 oz./gal. Accordingly, it is not efficient to continue beyond the first 70 ampere-hours per gallon.

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when the electrolysis is carried out at room temperature. Under these conditions, 80 asf. is the highest current density that can be used without causing the anodes to darken and polarize excessively. The effect of raising the temperature and using PR current has not been thoroughly investigated to date.

Using direct current alone, a high speed plating bath can be prepared in a solution containing 26 oz./gal. of potassium cyanide. Nine-tenths of the anodes are placed on the anode rods and one-tenth on the cathode rod so as to produce a much higher current density on the cathodes than on the anodes. Then the temperature is raised to 130 deg F. and an anode current density of 10 asf. is applied. This results in a cathode current density of approximately 100 asf. Under these conditions 6.5 oz./gal. of copper are dissolved while passing 75 - 80 ampere-hours/gallon through the solution. Beyond this copper concentration, the efficiency drops very rapidly.

With or without PR current, using the electrolytic method, no copper is lost. For every ounce of copper dissolved about 0.8 ounce of potassium hydroxide is formed in the solution. After electrolysis, the solution should be analyzed for copper, free cyanide, carbonate and potassium hydroxide so that the solution can be adjusted to the required composition.

Electrolysis with copper anodes can be used in building conventional sodium cyanide baths. To dissolve 1 oz. /gal. of copper, approximately 12 ampere - hours/gallon must be passed through the solution. To make a conventional sodium cyanide bath, one should start with about 6.1 oz./gal. of sodium cyanide and electrolyze until 30 ampere-hours/gallon have passed through the solution.

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securing zinc cyanide of plating grade. Zinc oxide has been used for a number of years for the preparation and maintenance of bright zinc solutions. When high quality zinc oxide is employed, the resulting plating solution may require less purification at the start than when the zinc cyanide is used as the metal salt. Zinc oxide usually contains 80.3 per cent zinc metal. To increase the zinc concentration in the bath by 1.0 oz./gal. 1.24 oz./gal. of zinc oxide is required. One unit (oz., lb., and so on) of zinc cyanide is replaced by 0.7 units of zinc oxide. For each unit of zinc oxide employed, 1.2 units of sodium cyanide is required to form zinc cyanide in a new bath. The cyanide additions to be made to an operating solution when zinc oxide is added should be determined by a total cyanide titration. Each unit of zinc oxide added will release 1.0 unit of sodium hydroxide.

Alkaline zinc solutions can also be prepared by electrolysis if zinc cyanide or zinc oxide are not available. The method involves the electrolyzing of a sodium cyanide — sodium hydroxide solution using high purity zinc anodes and steel cathodes. Sufficient sodium cyanide is dissolved in a tank to provide the proper sodium cyanide/zinc ratio. Add 5 oz./gal. of caustic soda and then electrolyze until approximately 120 - 125 ampere-hours/gallon have been passed through the solution or the proper zinc concentration is indicated by analysis.

For building a solution to have a metal concentration of 4.5 oz./gal., a total sodium cyanide concentration of around 11.5 oz./gal. to yield a cyanide: zinc ratio of 2.6 and a sodium hydroxide content of 12.0 oz./gal., fill the tank half full of water and dissolve 31 lb. of sodium hydroxide and 75 lb. of sodium cyanide for each 100 gallons of solution desired. After the salts have dissolved, the bath is brought to

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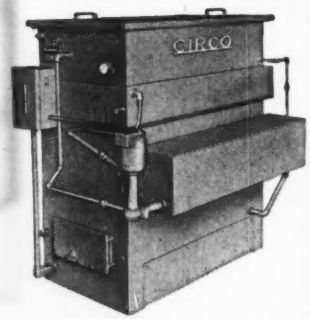

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Place as many zinc anodes as possible on the anode rods, adjusting the area for a current density of 15 asf. on the anodes, or an even higher current density if it is possible to do so without causing abnormal polarization. Elliptical or bar anodes are preferable since almost all current passed will then yield zinc to the bath, but ball anodes may be used if the containers are kept full.

Clean steel cathodes, racked work or even empty ball anode containers are suspended from the cathode rod. A minimum cathode area is desirable so that only a small amount of zinc is deposited under the high cathode current density conditions. It is suggested that the current density be of the order of 70 asf. The temperature during electrolysis should be kept below 85 deg. F. It is desirable to maintain the temperature of the solution during electrolysis as low as possible to ensure low cathode efficiency. Up to 5-10 amp./gallon can be used to electrolyze the bath for a total of approximately 120 ampere - hours/gallon at which time the zinc metal concentration should be around 4.5 oz./gal. Then the anode area should be adjusted to normally recommended conditions. The bath should be analyzed and the sodium cyanide and sodium hydroxide adjusted for formula amounts. Normally, little adjustment will be required. The bath is finally purified with zinc dust or sodium sulfide as recommended by the purveyor of the particular solution employed.

Actual runs have shown that the cathode efficiency under the conditions outlined above will be in the order of 10 per cent. The zinc deposit on the cathodes, empty ball anode containers, or whatever is used as a cathode surface, can be salvaged by transferring to the anode rod and deplating during subsequent production runs.

Undoubtedly many other substitutions and rearrangements of methods must be employed by the plater to meet the constantly changing supply situation. Although a subject apart from this article, every effort should be directed toward the efficient utilization of chemicals and anodes. Great progress has been made in using mist sprays for washing plating solution off the work as it leaves the plating tank; in the use of save rinses; the use of ion exchange resins for the recovery of metals, and the maintenance baths to produce balanced anode and cathode efficiencies. Much thought has been given to the racking of work to avoid excessive dragout losses and to achieve better distribution of deposit, thus stretching the lean metal supplies.

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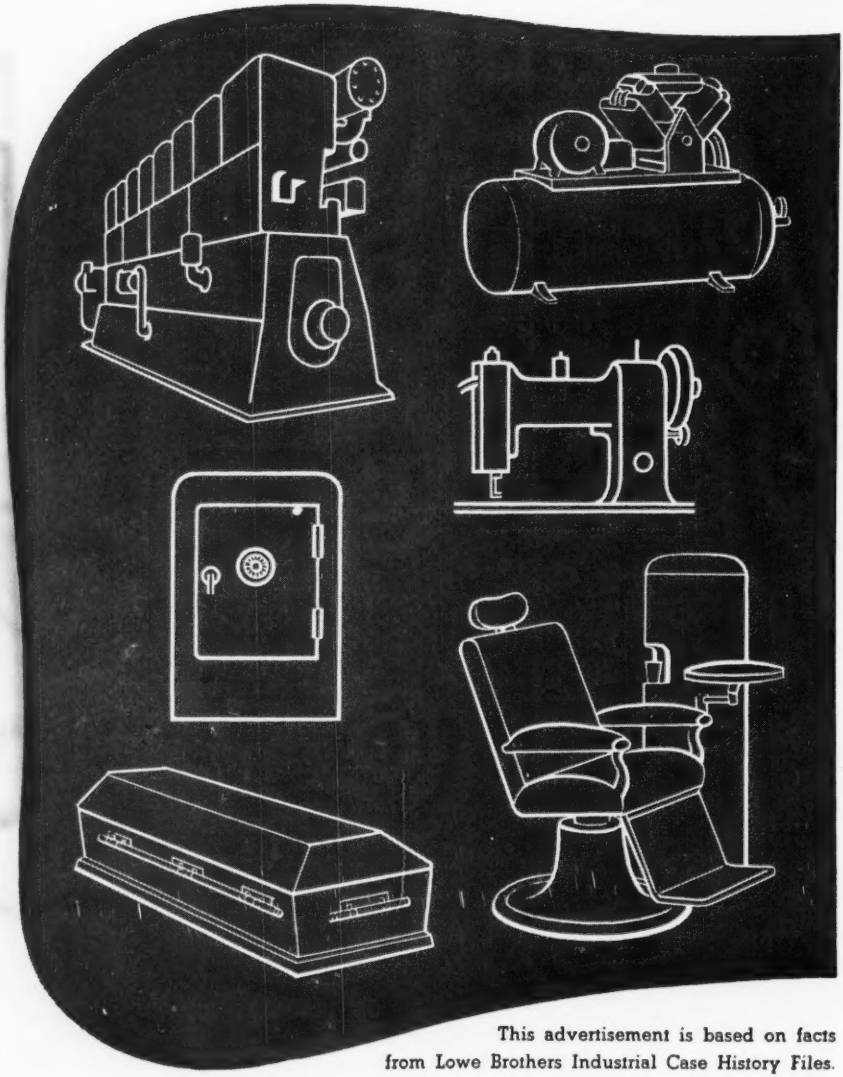

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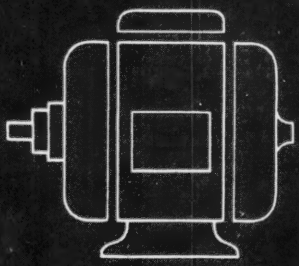

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Metallizing For Corrosion Prevention

By GILBERT C. CLOSE

FINISHING with sprayed metal is becoming more and more popular in conjunction with structural steel and sheet metal products that require a high degree of protection during service life. Zinc and aluminum are the most common spray metals, with cadmium running a poor and rather expensive third. These metals are anodic to steel, and as such act to passivate the base metal in a manner to offset many of the more common corrosive tendencies. When appearance is not important, sprayed metal only is used as the final outer coating. When good appearance is a factor, the sprayed metal is used to improve corrosion resistance and provide a fine bonding surface for subsequently applied organic coating materials. In fact, a combination of sprayed metal, primer, and outer organic coating offers one of the best protective coating combinations for steel it has been possible to devise.

The metallizing process is not new, but its current widespread use was given great impetus during World War II when plating metals became scarce and many of the better organic priming and coating materials were hard to obtain. Stop-gap applications of metallizing, developed during that critical period, were found to be so effective that many of them were retained at the expense of older finishing processes. Zinc coating of small steel hardware parts such as nuts, screws, washers and fittings was one finishing operation that came to stay. Another was the replacement of cadmium plating on steel with sprayed zinc or aluminum to offset the corrosive tendencies of salt water and saline or industrial atmospheres.

Currently, one of the most common applications of metallizing in corrosion prevention work is the use of sprayed aluminum or zinc on all types of structural steel. A zinc coating of from 0.010 to 0.120 inch thick has a life expectancy of from 60 years in rural areas down to 10 years when immersed in salt water. Other common applications include zinc coatings on ship hulls, tanks, towers, bridges, refrigerator elements, pole-line hardware, and dam gates. Sprayed coatings are used extensively for the protection of shop equipment. Fans, vats, filter beds, solution tanks, degreasing tanks, furnace parts, processing pots,

crucibles and retorts are but a few of the items so processed.

It is not the purpose of this article to list all the uses of metallizing. Rather, it is desired to point out the value of the process as a protective coating for steel, and give data that will aid finishing engineers and executives in trying out the process, experimentally or production-wise, in their own shops.

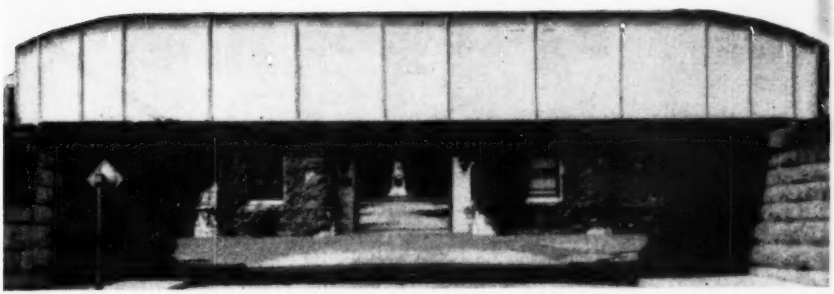
In any discussion of metallizing, it is necessary to divide the process into two principal categories; namely, the use of sprayed coatings for corrosion prevention, and the use of sprayed coatings in build-up and salvage work. These uses have little in common, require different application procedures, and must meet entirely different service requirements. The information in this article pertains to the application of protective coatings only.

Some knowledge concerning the physical metallurgy of sprayed metal is useful when considering possible applications of the process. In metallizing, the applied metal does not fuse with the base metal, but adheres by mechanical bond. To secure this bond, it is necessary to roughen the base metal to provide numerous microscopic irregularities around which the sprayed metal may key and anchor as it hardens. Improper base metal surface preparation is responsible for more metallizing failures than all other factors combined.

Sprayed metal is hard, relatively brittle, and has high compressive strength. It is also somewhat porous. This porosity can be materially reduced by wire brushing the surface after spraying, or by shot-peening it to increase sprayed metal density. In one respect, this porosity is a disadvantage when the sprayed metal is used as a protective coating. Further, specific service conditions require certain minimum thicknesses of metal. On the other hand, this porosity implements anodic protective action between the aluminum or zinc coating and the steel base metal, and under certain conditions actually increases the coating's protective value.

Sand or grit-blasting is most often used to prepare surfaces prior to application of the protective coating. Standard blasting equipment may be used, but air pressure, abrasives, and

Fig. 1—This zinc-coated sheet steel railroad bridge, located in Belgium and thereby subject to salt atmosphere, was sprayed 30 years ago. It is still in good condition.



nozzle manipulation must be carefully controlled to secure best results. Care must be used to prevent warpage of large sheet sheet metal structure during the blasting operation. A reduction in air pressure, lighter abrasives, and holding the nozzle farther from the work will minimize warping tendencies of the sheet structures.

When blasting large thin metal structures, an angular variety of flint or garnet sand, from 16 to 20 mesh in size, has proved very effective. Approximately 60 pounds air pressure and a ⅛-inch nozzle held 12 inches from the work should be employed. The abrasive should be directed vertically against the work, and the nozzle moved systematically back and forth with the blast paths overlapping. When using sand, it should be air cleaned between each blasting operation to remove dust and fines that will tend to polish rather than roughen subsequent work.

Steel grit, however, despite its initial cost, is cheaper to use in the long run than sand. In preparing surfaces to be metallized, life of the grit is approximately 30 times that of the sand, and air cleaning each time it is used is not necessary. Number 60 steel grit

Table I

RECOMMENDED COATINGS FOR SALT ATMOSPHERES

(The coating thickness on smaller objects and hardware items that can be barrel-sprayed can be reduced from 0.001 to 0.002 inch because of closer thickness control.)

Coating Requirements	Minimum Life 15 years	Minimum Life 7 years
Paint not required. No maintenance.	0.010 - 0.012 inch aluminum over grit blast. 0.012 - 0.015 inch zinc over sand blast. No paint.	0.006 - 0.008 inch aluminum over grit or sand blast. No paint.
Appearance not important. No maintenance.	0.007 - 0.010 inch aluminum over sand or grit blast, plus one coat of paint.	0.004 - 0.006 inch aluminum over sand or grit blast, plus one coat of paint.
Paint appearance desired. Repaint every 5 years.	0.004 - 0.006 inch aluminum over sand or grit blast, plus one or more coats of paint.	Same as for 15 years minimum life.
Metallic appearance and bright finish. Revarnish every 5 years.	0.004 - 0.006 inch aluminum over sand or grit blast, plus one or more coats clear Bakelite varnish or glycerol phthalate resin finish.	Same as for 15 years minimum life.

Use paints pigmented with aluminum, iron oxide, red lead, titanium oxide, and zinc-zinc oxide on sprayed aluminum only. Do not use quick-drying paints and lacquers.

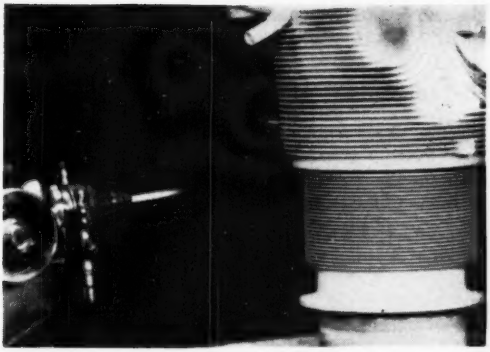


Fig. 2 — Spraying aluminum on a radial aircraft engine cylinder. The aluminum gives good protection from corrosion and also aids in heat dissipation.

will prove successful on large, light metal sections, and will not cause warpage if the air pressure is kept down and the nozzle is sufficiently small. When blasting heavier steel structures, a 50-50 mixture of No. 30 and No. 40 grit will give good results. With the heavier steels, nozzle size may be increased to $\frac{5}{16}$-inch and air pressures to 100 pounds. In all cases, the abrasive should be directed vertically against the work to obtain maximum surface roughness possible.

Metallizing should be accomplished as soon as possible after blasting to prevent surface oxidation or rusting of the prepared surface. Strict cleanliness after blasting is necessary, and work should be handled with clean gloves when it is removed from the blasting chamber to be sprayed. Large structures blasted in the open require just as much care to prevent any trace of surface contamination prior to the spraying operation.

Though manipulation of the metallizing gun does not require extensive experience, the operator should be sufficiently familiar with the tool to control coating thickness within narrow limits, and to keep the temperature of the base metal as low as possible. Ac-

Fig. 3—Spraying a huge pipe line with zinc. This coating will outlast many years any currently available organic coating materials.

tual adjustment of the metallizing gun will vary somewhat between models, and the manufacturer's recommendations should be rigidly followed.

Table II

RECOMMENDED COATINGS FOR INDUSTRIAL ATMOSPHERES

Coating Requirements	Minimum Life 20 years	Minimum Life 10 years
No paint. No maintenance.	0.010 - 0.012 inch aluminum. 0.012 - 0.015 inch zinc.	0.006 - 0.008 inch aluminum or zinc.
Appearance not important. No maintenance.	0.007 - 0.010 inch zinc or aluminum, plus one coat of paint.	0.004 - 0.006 inch zinc or aluminum, plus one coat of paint.
Painted. Repaint every 5 years.	0.004 - 0.006 inch zinc or aluminum, plus one or more coats of paint.	Same as for 20 years minimum life.
Bright metallic appearance. Revarnish every 5 years.	0.004 - 0.006 inch zinc or aluminum, plus one or more coats of clear Bakelite varnish or glycerol phthalate resin finish.	Same as for 20 years minimum life.

(*) See sub-note Table I.

Table III

RECOMMENDED COATINGS FOR RURAL ATMOSPHERES

Coating Requirements	Minimum Life 30 years	Minimum Life 10 years
No paint. No maintenance.	0.010 - 0.012 inch zinc.	0.003 - 0.005 inch zinc.
Paint appearance desired. Repaint every 5 years	0.004 - 0.006 inch zinc, plus one or more coats of paint.	Same as for 30 years minimum life.
Bright metallic finish desired. Revarnish every 5 years.	0.004 - 0.006 inch aluminum, plus one or more coats Bakelite varnish or glycerol phthalate resin finish.	Same as for 30 years minimum life.

(*) See sub-note Table I.

During spraying, the gun nozzle should be held from 6 to 8 inches from the work surface, and should be kept in continuous motion to prevent overheating of any one area. A uniform gun-motion speed should be developed to aid in securing the desired coating thickness. The ribbons of spray metal laid down by each gun pass should overlap approximately one-third to compensate for the tendency of the ribbon to run thin near the edges. When the surface must be sprayed more than once to build up the required coating thickness, the spray ribbons should be applied at right angles to each other.

When an operator learns his business and has developed a uniform technique, coating thicknesses may be held within a tolerance of a few thousandths of an inch. Until such experience is acquired, the best practice is to spray test panels prior to each operation, using the same gun-motion speed that will be used during spraying of the work. By measuring the test panel thickness prior to and after spraying, and by counting the number of spray gun passes made, it is easy to determine the amount of metal being deposited during each pass.

Coating thicknesses employed vary with the corrosive conditions to which the part will be exposed, and whether or not the sprayed metal will be covered with an organic finish. In general, no coating should be less than 0.008 inch thick. In protecting iron and steel from salt water or saline atmosphere, the minimum coating thickness should be between 0.012 and 0.015 inch.

It has been determined experimentally that the protective properties of sprayed metal can be materially increased by wire brushing the surface after spraying. When wire brushing sprayed aluminum or zinc, use a brush from 4 to 6 inches in diameter and about 2 inches wide. Stainless steel or Monel bristles are best. Shot peening to close the sprayed metal pores is limited to parts where shot recovery is possible, but is very effective when it can be used.

Fig. 4—Spraying a ship's water cask with corrosion resistant Monel metal.

As previously stated, sprayed metal offers an excellent base for paint. This is due largely to its porous surface. Paint may be applied to sprayed metal surfaces solely for the sake of appearance, or to increase protection. It has been found that sprayed aluminum is a better base for paint than sprayed zinc, though under ordinary conditions either can be used. Zinc chromate and iron oxide-zinc chromate paint in long oil varnish vehicles are excellent corrosion inhibitive paints for aluminum, and may also be used on zinc.

When maximum protection is desired, the organic coatings recommended in the accompanying tables

should be used. When other than the recommended paints are desired for the sake of appearance, they should be applied over a coating of zinc chromate primer. Very quick drying paints or lacquers should always be avoided for best results.

Vehicles made with Bakelite and glycerol phthalate resins are very satisfactory for application over sprayed zinc or aluminum. The bituminous paints also give good results with these metals. Paints with durable vehicles containing pigments such as aluminum, red lead, titanium oxide, zinc oxide and iron oxide give good

Table IV

RECOMMENDED COATINGS FOR IMMERSION IN FRESH WATER**

Coating Requirements	Minimum Life 15 years	Minimum Life 7 years
No Paint. No maintenance.	0.012 - 0.015 inch zinc. 0.010 - 0.012 inch aluminum over grit blast.	0.006 - 0.008 inch zinc or aluminum.
Paint. No maintenance.	0.008 - 0.010 inch zinc plus two coats paint. 0.006 - 0.008 inch aluminum plus two coats paint.	0.003 - 0.005 inch zinc plus two coats paint. 0.004 - 0.006 inch aluminum plus two coats paint.

(*) See sub-note Table I.
(**) Zinc not recommended for immersion in hot fresh water over 125 deg. F.

Table V

RECOMMENDED COATINGS FOR IMMERSION IN SEA WATER

Coating Requirements	Minimum Life 10 years	Minimum Life 5 years
No paint. No maintenance.	0.010 - 0.012 inch zinc or aluminum.	0.006 - 0.008 inch zinc or aluminum.
For anti-fouling (sea growths). Repaint every 2 years.	0.006 - 0.008 inch aluminum plus one coat Navy F-105 anti-fouling compound, or one coat zinc chromate primer and one coat Mur-Cop anti-fouling compound.	Same as for 10 years minimum life.

Pure, uncoated zinc is good anti-fouling coating.
Sprayed aluminum fouls badly unless anti-fouling compound is used.
Do not use anti-fouling compounds over sprayed zinc.

(NOTE: Tables adapted from information furnished by Metallizing Engineering Co., Inc., Long Island City 1, N. Y.)

service when applied over sprayed aluminum.

From the appearance standpoint, a very satisfactory finish can be obtained by painting sprayed aluminum with a clear Bakelite varnish. This finish has all the brightness of the freshly sprayed aluminum, and under ordinary conditions, revarnishing is necessary only once every five years.

Sprayed zinc and aluminum are particularly useful for finishing steel parts that will operate or give service while immersed in fresh or salt water. Recommended coatings for immersion in fresh water are given in Table IV; those for salt water immersion in Table V. Zinc should not be used when the part will be immersed in hot water above 125 deg. F., nor should it be used for immersion in distilled water.

Sprayed metal is not recommended for acid solutions stronger than acetic acid. For cold solutions with acids weaker than acetic, aluminum is generally recommended. The one exception to this rule is the use of sprayed lead coatings which have had the pores closed by either wire brushing or shot peening.

Protection of steel parts from heat corrosion is another important application of sprayed aluminum. Many foundry tools, heat exchangers, crucibles, ladles, furnace parts, and so on, are first given a spray coat of aluminum, then heated to approximately 1600 deg. F. This heating causes some diffusion of the aluminum into the steel surface, resulting in a coating that is highly resistant to heat oxidation.

It is evident from the foregoing that it is quite possible to forecast and enumerate the possible uses of sprayed metal for corrosion prevention. But when a severe corrosion problem is encountered, especially on products, it is certainly advisable to investigate the possibilities of using sprayed metal to combat it. Metallizing equipment is relatively cheap to install, and the process is sufficiently versatile to fufil many diverse jobs. Complete information, including type of gun to use, type of metal, surface preparation, coating thickness, and so on, is available from manufacturers of metallizing equipment.

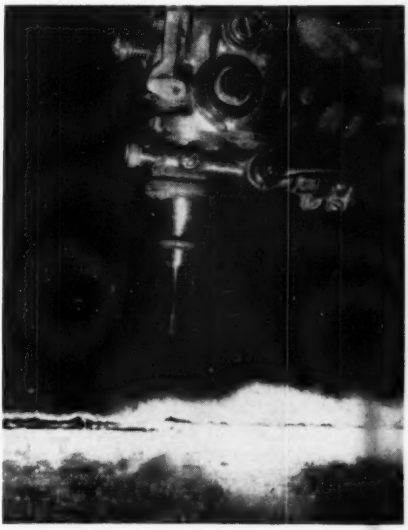


Fig. 5—Spraying zinc over a weld bead in steel plate. The anodic action of the zinc effectively prevents corrosion both from outside influences and the alloy constituents of the weld filler metal.

(All photos courtesy Metallizing Engineering Co., Inc., Long Island City 1, N. Y.)

In brief summary, metallizing should be looked upon as a relatively new process for use when corrosive conditions warrant the type of protection it offers, or when many years of maintenance-free corrosion protection is desired. It should not be considered as a replacement process. Its true value is based on the ability of the sprayed metal to withstand corrosive influences that would soon break down other types of surface protection.

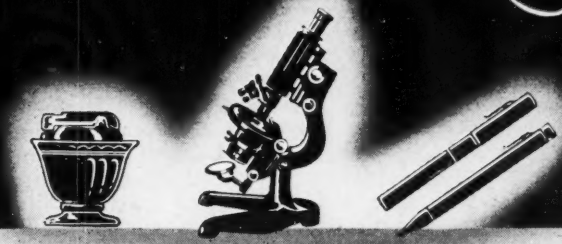
Spotlighting FINISHING Progress

Phosphate Coatings on Metal

THE useful life of steel and other metal products, when painted, depends to a large extent on the treatment of the metal surface prior to painting. On steel surfaces, phosphating before painting increases the corrosion resistance of the finished product by providing a good bond between the metal and paint, by inhibiting the spread of rust around chips and scratches in the paint film, and by minimizing the blistering, generally termed alkaline peeling. Paint-bonding to zinc, aluminum and cadmium surfaces is facilitated by phosphate coatings. Experience gained during and since World War II has emphasized the importance of phosphate coatings in finishing defense production.

Studies have been conducted at the Naval Research Laboratory by Jeanne B. Burbank on the fundamental nature of the phosphating process as applied to a ferrous surface, and the mechanism of the protective action of the coating. Among the factors which may affect the formation of phosphate coatings, their crystal structure and their corrosion resistance, the following may be listed: composition of the metal; pretreatment of the metal (pickling, degreasing, and so on); composition of phosphatizing solution; techniques of phosphatizing including operating temperatures, agitation of the solutions, and treatment times.

Rhodium Plating



Rhodium is one of the six platinum group metals. It is hard and has an untarnishable brilliant white color. In electroplating, it produces beautiful results and is widely used for this purpose in jewelry — even precious metal jewelry. Its high reflectivity makes it excellent for mirrors for motion picture projectors and similar purposes. With restrictions upon usual plating metals, rhodium is the logical alternative for plating optical mounts, contacts for communication equipment, radar components, pen and pencil sets and a host of like objects.

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The inhibiting of rust may be accomplished by converting the surface of ferrous metals into insoluble phosphate salts, which render the metal surface less active chemically, followed by coating with oil, paint, varnish or lacquer. In addition to the corrosion resistance imparted by phosphate coatings, it has been established that these coatings also increase the wear resistance of iron and steel parts and facilitate their cold drawing.

On metal surfaces that have been freed from rust, oil and dirt, phosphate coatings are formed by dipping the work into the coating baths, carrying it through several sprays in a multistage power washer, or in some cases by applying the coating solution with a brush. The production line method to use is generally determined by the type of work, its size and the number of pieces to be processed. Phosphating materials are available for use in both a cleaning and phosphating function. Figure 1 shows a typical power spray washing machine for the automatic application of a protective phosphate coating. Figure 2 shows a section of a finishing department where calculator parts receive a phosphate coating before painting.

Effect of Surface Pretreatment on Phosphating

The treatment of the metal surface prior to phosphating is important in determining the size of the crystals that make up the phosphate coating. According to data presently by Jeanne Burbank, there appears to be no doubt that fine grained, uniform phosphate coatings have the highest corrosion resistance. From the studies that have been reported it appears most likely that the factors which determine the crystal size and uniformity of the phosphate coating are both physical

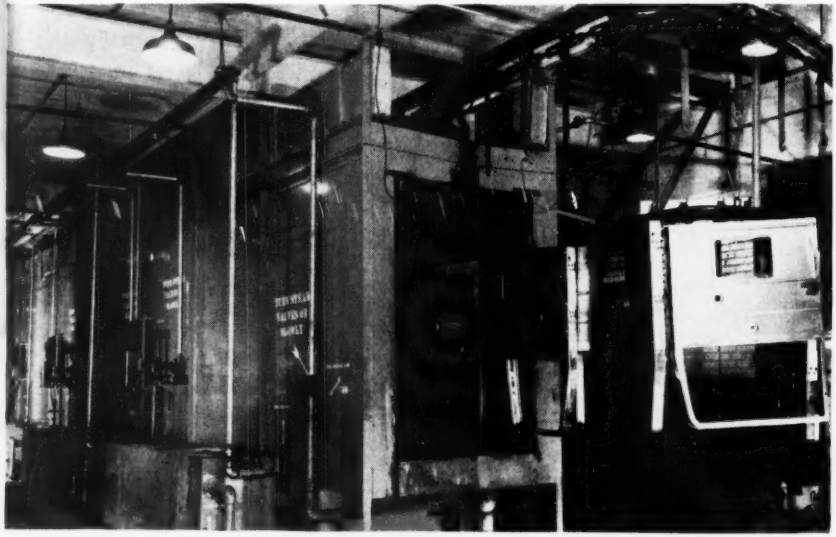

Fig. 1—Typical power spray washing machine for the automatic application of a protective phosphate coating to autocar cab doors in preparation for painting. *(Photo courtesy American Chemical Paint Co., Ambler, Pa.)*

PHILLIPS degreasers used by Air Force for removing Cosmoline

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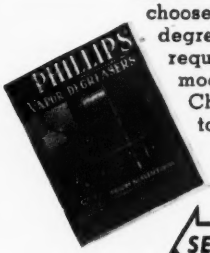

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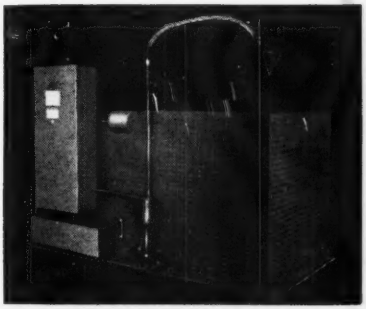

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Fig. 2 — A section of the finishing department where Marchant Calculator parts receive a phosphate coating before painting.
(Photo courtesy Parker Rust Proof Co., Detroit 11, Mich.)

and chemical in nature.

Surfaces must be free of foreign material such as mill scale, rust, soaps, and heavy grease before phosphating. Grease may be removed by treatment with organic solvents or alkali. Some commercial processes function as a combination of cleaning and phosphating. Figure 3 shows a multi-stage power spray washer for a commercial spray phosphate coating process. Also shown are tanks required for cleaning and phosphate coating by the dip process. When products are of the same general design, constructed of cold rolled steel, and adapted to processing on a monorail conveyor or belt, a multi-stage power washer of five or six stages (such as shown in Fig. 3) is the most convenient equipment to use, whether the products are large, like auto or bus bodies, or relatively small like radio cabinets. Figure 4 shows a six-stage cleaning and rustproofing machine.

Effect of Bath Composition on Phosphate Coatings

Jeanne Burbank pointed out that one series of studies reported in the literature on phosphating baths states that zinc phosphate type baths containing nitrate as the accelerator produce satisfactory results. In these reported studies the corrosion resistance of the coatings was evaluated by salt spray and atmospheric exposure tests. By comparing analyses of fresh phosphating baths with those of used and regenerated baths, this literature report indicated that nitrated zinc phosphate baths would probably undergo the least change during use. This they attribute to the presence of nitrates which react with the hydrogen liberated at the cathodic areas to depolarize the surface and prevent shielding the surface with a film of hydrogen. Of interest is the fact that some military specifications discussed below describe phosphate coatings with nitrate as an accelerating agent.

Military Specifications for Phosphate Finishes

According to industrial data made available by American Chemical Paint Company, protective finishes meeting U.S.A. 57-0-2; Type II, Class A, and equivalent requirements of other specifications, are manganese-iron phosphate coatings which have been treated with non-drying petroleum oils containing corrosion inhibitors and suitable for use on sliding, rubbing, or bearing surfaces. These coatings are used where a non-galling finish is desired. According to specification requirements, these finishes must with-

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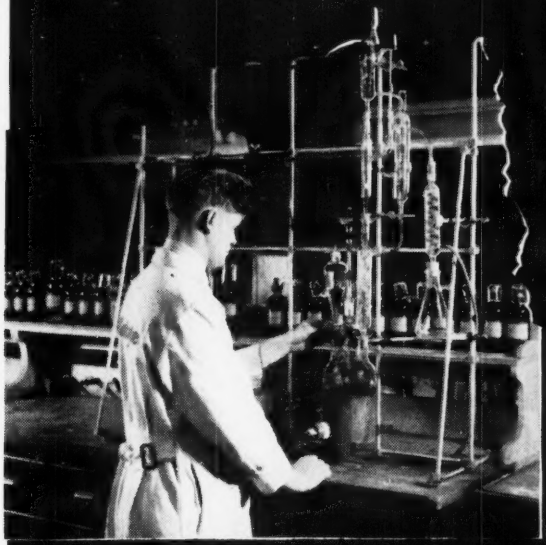

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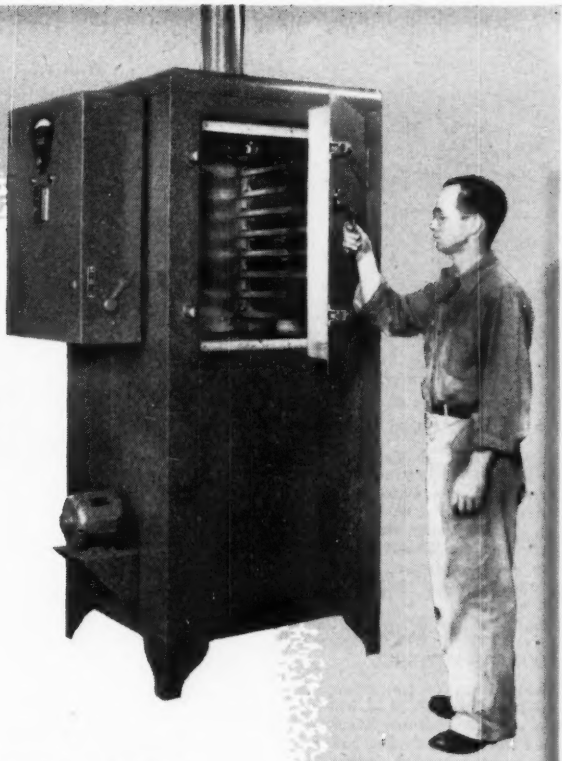

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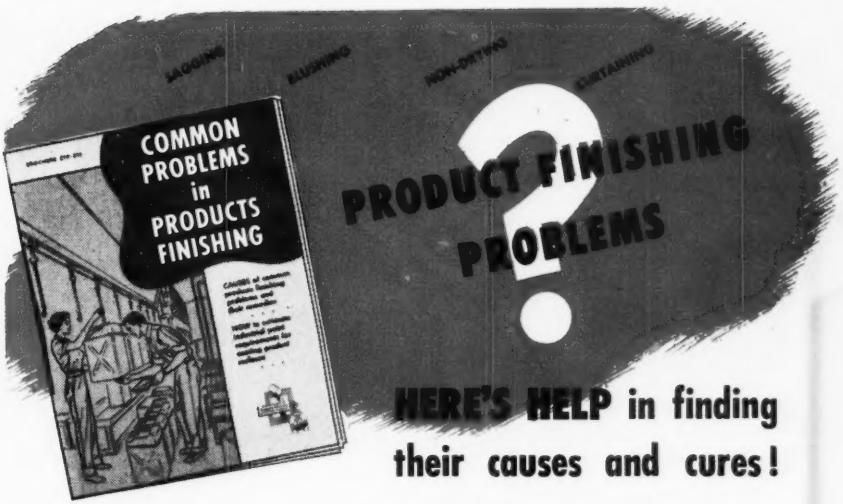

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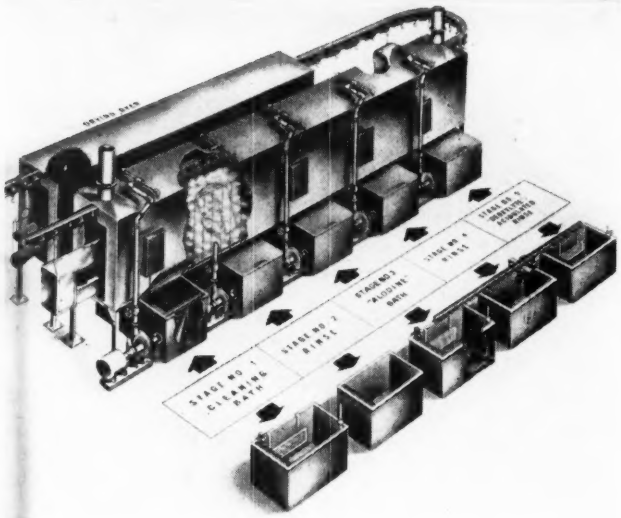

Fig. 3 — (Top) Multi-stage power spray washer for spray phosphate coating process. (Bottom) Tanks for dip phosphate coating process.
(Illustration courtesy American Chemical Paint Co., Ambler, Pa.)

stand one hour of salt spray exposure when unoiled and 24 hours' salt spray exposure when treated with a suitable oil.

To obtain a Class A finish, the properly cleaned (rust-free and scale-free) parts are immersed for not less than 15 minutes in a hot balanced phosphate solution containing nitrate as an accelerating agent until a uniform crystalline phosphate coating is formed, after which the parts are immediately rinsed in clean water, followed by a second rinse in a controlled dilute chromic acid solution. After drying, a suitable corrosion - resistant oil is applied. Class "A" Finish is now specified for such items as small arms, machine gun parts, automotive and aircraft components such as pistons, piston rings, cylinder liners, cracks, camshafts, gears, tappets, valves, and other rubbing parts, tank treads, and many other components.

Protective finishes meeting U.S.A. 57-0-2; Type II, Class B, and equiva-

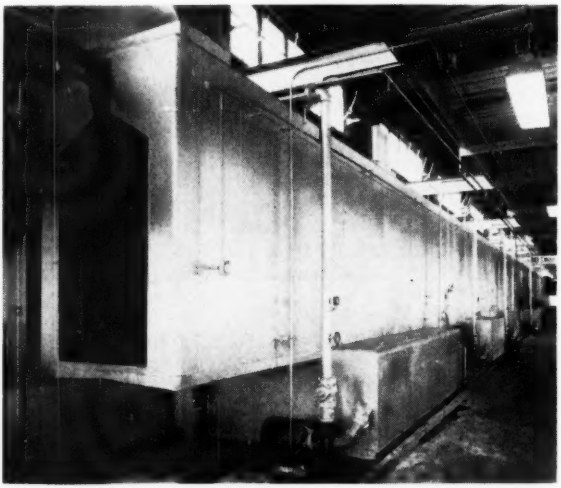

Fig. 4—A six-stage cleaning and rustproofing machine at the Coleman Company which was designed and installed by R. C. Mahon Company.
(Photo courtesy the R. C. Mahon Co., Detroit 34, Mich.)

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The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

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lent requirements of other specifications are zinc phosphate coatings which have been treated with a rust preventive suitably reduced for application and containing corrosion inhibitors. These finishes are for use on non-moving parts only and shall be substantially dry to touch. According to specification requirements, these finishes must withstand 2 hours of salt spray exposure, when unoiled, and 36 hours of salt spray exposure when treated with a suitable oil.

To obtain a Class B Finish, the properly cleaned articles are immersed for not less than 30 minutes in a hot, balanced phosphate rustproofing solution containing nitrate as an accelerating agent, or for 1 hour in a hot, dilute phosphate solution without an accelerating agent, until a uniform crystalline phosphate coating is formed, after which parts are immediately rinsed in clean water, followed by a second rinse in a controlled dilute chromic acid solution. After drying, a suitable corrosion-resistant oil is applied. Class "B" finish is now specified for metallic belt links, fire control instruments, steel aircraft parts, certain steel projectiles, bolt assemblies, hardware items and many other components.

U. S. Army Specification 57-0-2 Type II, Class C (also Joint Army-Navy Specification Jan-c-490; Grade I) covers the requirements of a phosphate coating which bonds paints to metal, inhibits the spread of underfinish corrosion, and thereby protects painted steel from rusting. The finish must have a coating weight of 150 mg. minimum and after painting withstand a 250-hour salt spray test. It has been reported that this type finish has been used for projectiles, rocket heads, rocket motors, tanks, jeeps, containers for small arms, cartridge tanks, 5-gallon gasoline containers, shells, rockets, bombs, vehicular sheet metal, steel drums and other products.

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Phosphate Coatings Applied from Gel Medium

Another phase of the Naval Research Laboratory studies concerned possible methods of application of phosphate coatings to ships' hulls in drydock. One possible method of application would be to make use of a viscous medium such as a paint base. Experiments were carried out to determine if a phosphate coating could be deposited on steel from a medium such as a gelatinous mixture. The gelatinous phosphating medium was made by dissolving agar in hot distilled water and adding phosphating chemicals so that the final concentration of the mixture was equal to that of a liquid zinc phosphating bath. This mixture was poured over freshly sand-blasted steel panels. After standing overnight, the panels were removed from the gel, rinsed in hot water, dried and the X-ray diffraction pat-

to page 82→

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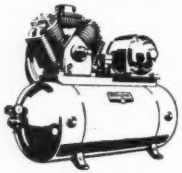

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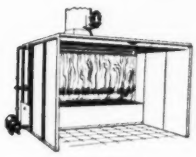

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FLEXIBLE SHAFT EQUIPMENT

terns and photomicrographs recorded.

The coating deposited from gel medium on the steel surface was made up of small adherent crystals that covered the surface very uniformly.

One example of the treatment of hulls in drydock is the Mare Island procedure which calls for sandblasting of the hull with hard silica sand that has been wet with a water solution of trisodium phosphate and potassium dichromate. The sand and dust are then brushed from the hull with a soft foxtail brush and the hull is immediately painted. If the painting is not done before light rusting occurs, the hull is washed down with a 10 per cent phosphoric acid solution. It was reported that this treatment produces a non-uniform, powdery deposit that has little resemblence to the phosphate coating produced by industrial processes.

* * *

Examining the Adhesion of Paint to Steel

WORK carried out in the Corrosion Laboratory of the Tin Research Institute by S. C. Britton and R. M. Angles has resulted in a method for testing the adhesion of painted surfaces by pressing a strip of cellulose adhesive tape on the surface and then removing it with an abrupt pull. The adhesive tape carries with it, when it is removed, areas of paint that have poor adhesion. Details of a reproducible method based on this fact were recently reported by Britton and Angles in the "Journal Of The Iron And Steel Institute" (British). The test is useful for comparing paints and methods of preparing steel for painting by revealing the area of paint loosened by corrosion or by controlled physical damage. It is superior to the removal of loosened paint by rubbing because it is more easily reproduced and the evi-

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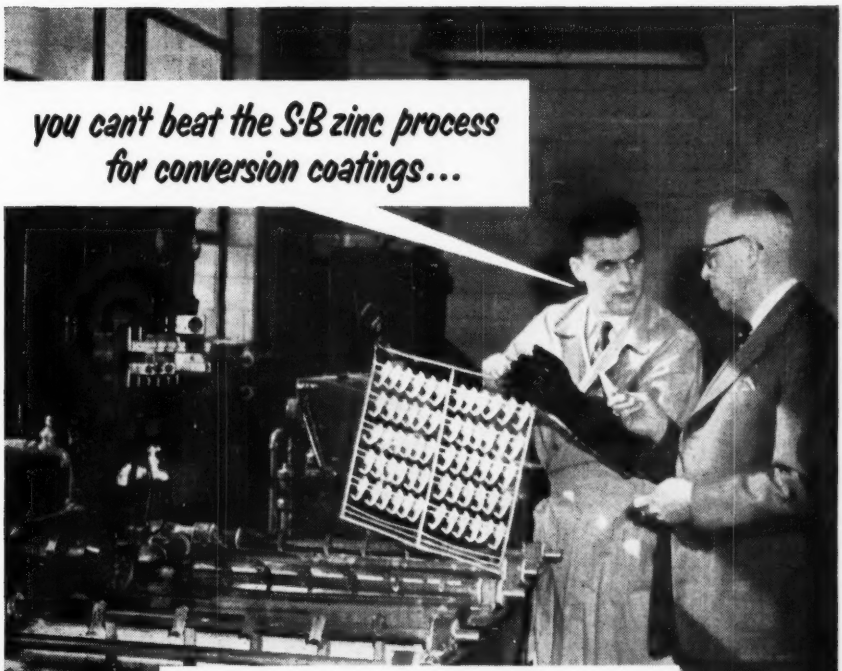

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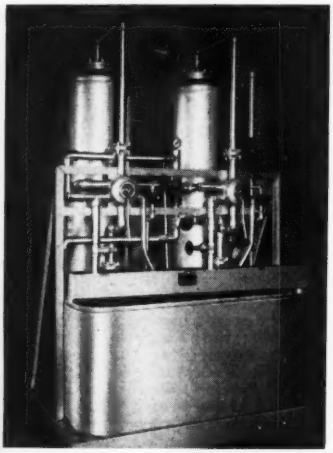

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dence of changes on the underside of the paint can be preserved.

The test is particularly suitable for the examination of panels after a salt spray corrosion test. It is reported that the results obtained using the new method in corrosion tests and in physical damage tests have been consistent with general experience in showing the limitation on the spread of deterioration achieved by suitable methods of surface preparation before painting, such as coating with electrodeposited tin or treating with phosphate solutions.

According to Britton and Angles, when painted metal is exposed to corrosion, the paint often loses adhesion over an area extending beyond the visibly corroded zone. Other investigators have reported that the spread of corrosion under a paint film on steel immersed in salt solution, or exposed to its spray, follows the progress of an alkali-producing zone in which the paint is loosened. Thus, it seems likely that, for most conditions of exposure, paint loosening is a part of the corrosion process and may be as important as the more easily detectable rust formation.

Preliminary experiments were conducted by Britton and Angles using steel panels with various surface treatments which had received a single coat of stoving enamel. The panels were then tested by spraying with artificial sea water after they had been damaged according to the provisions of P.B.S. 1391*. The damage before corrosion included two similar parallel scratches. At the end of the test, after the extent of visible blistering and rust had been recorded, the area surrounding one scratch of each panel was rubbed with fine steel wool until all paint

*"Performance Test for Protective Schemes Embracing Stoving Paints Used in the Protection of Light Gauge Steel and Wrought Iron Against Corrosion." Provisional B.S. 1939: 1947 (British).

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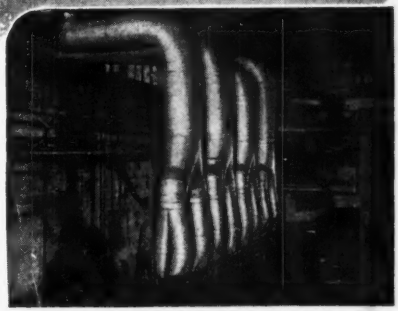

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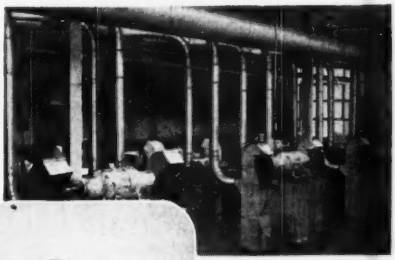

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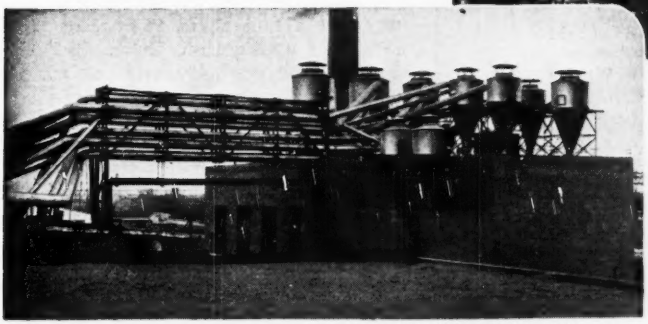

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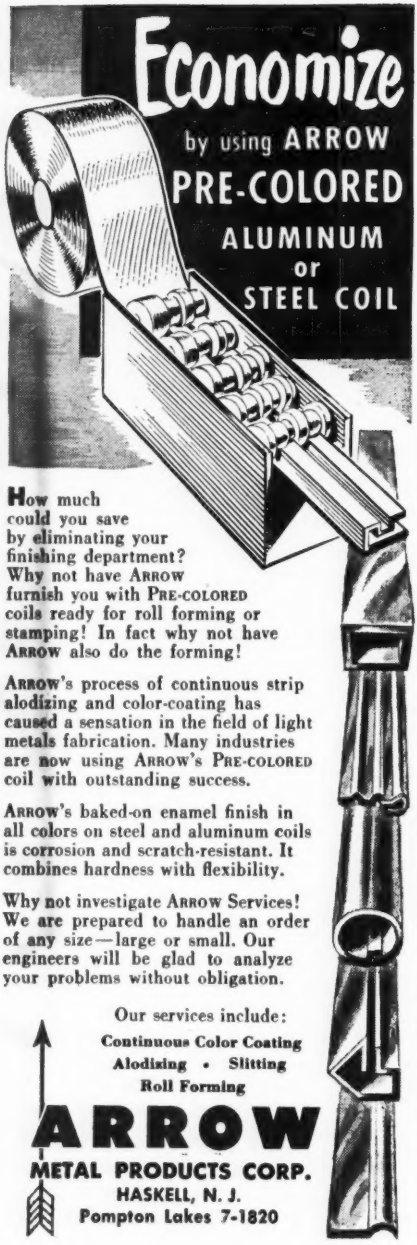

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that could be detached without rubbing through the panel was removed. The whole length of the other scratch and a ½-inch zone on either side of it were covered with commercial cellulose adhesive tape, pressed in position.

A short length of the tape was left free at the edge of the panel and by pulling this sharply, the tape was jerked from the painted surface. It carried with it areas of paint which corresponded very well with the areas on companion scratches that were bared by abrasion with steel wool. According to observations reported by Britton and Angles, there seemed to be no doubt of a genuine loss of adhesion. More prolonged experiments suggested that the adhesive tape test revealed developments at an earlier stage than the rubbing-off method of examination. The under surface of the paint removed showed signs of rust-spread, which had not been visible on the upper surface.

Adhesive Tape Test

The procedure used in the preliminary trials had three variables: the method of application, the method of removal, and the nature of the adhesive tape. Further work was carried out to define the requirements of the test more precisely. It was found that provided the tape was pressed sufficiently firmly on to a painted surface to ensure uniform contact, with the exclusion of all air bubbles, the application of further pressure had little effect on the load required to remove the tape. The adhesive tape is applied by pressing down one end and passing the thumb along the tape, applying a firm pressure and stroking out any trapped air bubbles.

In discussing the details of the test method, it was pointed out that the paint surface must be free from material such as visible moisture, dried up salts, dirt, and so on. The best pre-

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paratory procedure is either to wash the test surface with water and dry it in air or to remove visible moisture with a cloth or blotting paper. When blisters are well developed it is preferable to press blotting paper on to the surface first, to burst them and to remove their fluid content.

The tape used must be strong enough to withstand the abrupt pull needed to remove it whole. The force used must be less than that required to pull paint away from a surface to which it adheres, but must be greater than that required to break the paint film across a width equal to that of the tape. According to Britton and Angles, to provide the required tensile strength the weight of tape should not be less than 60 gm./sq.m. These properties are exhibited by cellulose adhesive tape supplied to Ministry of Supply Specifications C.S. 2500 (British). It was also reported that most of the tape sold for packaging is suitable. A 1-inch wide tape is generally most useful. A strip of the tape large enough to cover the area to be tested is pressed firmly on the surface, leaving at least 1 inch of tape free.

A quick pull is needed to break the paint film along the edge of the zone of poor adhesion. The tape should be removed quickly from the surface by pulling sharply on the loose end. A mechanical means for removing the tape was suggested. Another method which requires no special apparatus was developed. The panel with tape in position is supported 18 inches above the bench with test side downward, and the free end of the tape is passed around a light bar and stuck to itself to form a loop supporting the bar. A 2-pound weight is tied to a clip by a 12-inch piece of string and the clip is fixed on the bar with the weight supported immediately below it. The weight is then allowed to fall freely and pulls off the tape with the requis-

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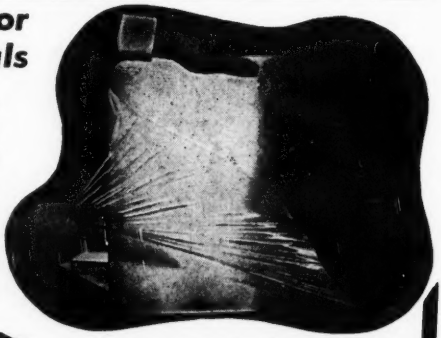

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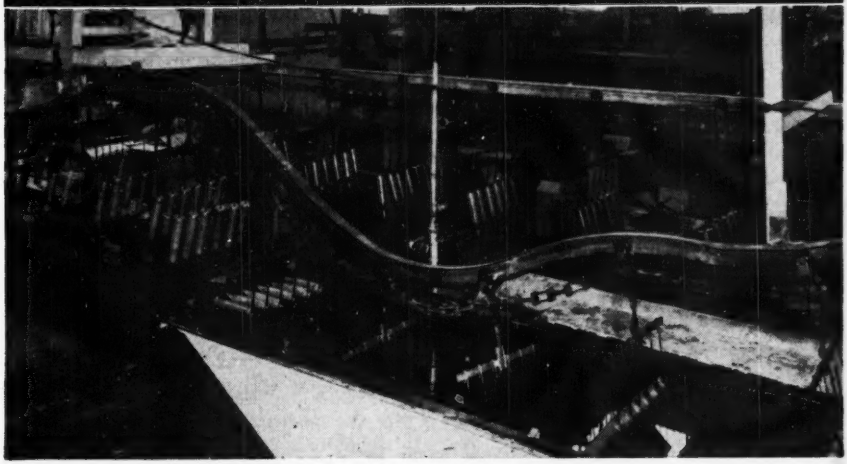

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ite jerk. The same results were obtained whether removal of the tape was accomplished by hand or with mechanical devices.

The reproducibility of the test was checked on determinations of loss of adhesion caused by corrosion and physical damage. Apart from its use in comparative testing, the tape method has applications in research. It appears to be well suited for use in testing the inhibitive character of primers, by studying the effects of drops of salt solution placed on the paint coating with or without a scratch. The method may also find use in studying the mechanism of corrosion spread under paint.

The method is of value in accelerated laboratory corrosion tests. On naturally weathered panels, as in laboratory tests, the tape method has revealed adhesion failures associated with slight under-film corrosion, which could not be detected on the upper paint surface. It also makes apparent such failures as may occur on inadequately prepared metal surfaces. One point brought out by Britton and Angles was that surfaces on which under-rusting at many points may cause adhesion loss are not always those that show the greatest development of serious rusting on more prolonged exposure. However, in most practical applications, loss of paint adhesion is itself important owing to the risk of further damage by rough treatment.

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* * *

Adherence of Cobalt Ground-Coat Enamels

IN the porcelain enameling of sheet steel, it is well known that the presence of a fractional percentage of cobalt oxide in the ground coat enamel glass is an important factor in the development of the adherence to the iron. Studies conducted by J. H. Healy and A. I. Andrews, Department of Ceramic Engineering, University of Illinois, and recently reported in the "Journal of The American Ceramic Society", have contributed to the development of the cobalt reduction theory for the adherence of sheet iron ground coats. On the basis of special techniques it was shown that cobalt oxide of the enamels is reduced to cobalt metal which forms a bond with the iron and the enamel.

Healy and Andrews produced data to show that the formation of cobalt metal from frits containing cobalt oxide is not a chemical electrolytic-deposition process, but is one of straight chemical reduction by hydrogen. Some of the conclusions drawn from experiments to support their viewpoint are as follows: a grayish layer developed first between the iron oxides and the enamel; metallic cobalt particles, needles, and dendrites were formed on

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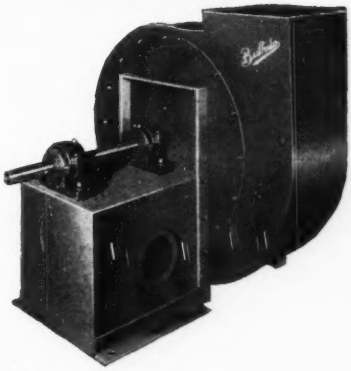

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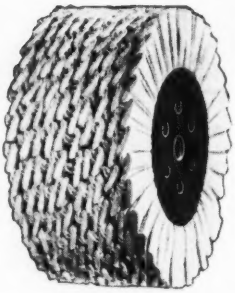

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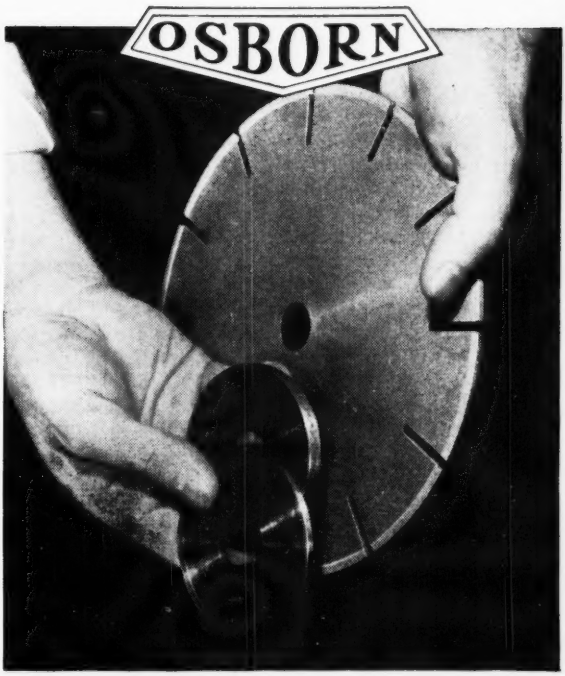
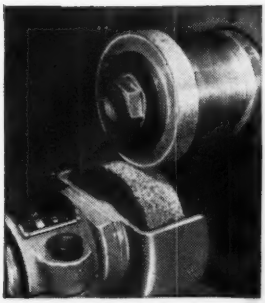
surfaces of bubbles in the enamel; hydrogen gas, without iron being present, reduced cobalt ions from glass to form cobalt metal particles, needles and dendrites.

Another experimental conclusion pointed out was that metallic cobalt did not form from enamels containing the oxide when fired on chromium metal, although cobalt is more noble than chromium in the electromotive series. It was also brought out that published data indicate that there is an ample amount of hydrogen available at the interface. The process of consuming the hydrogen in the cobalt oxide reduction eliminated the insulating layer between the iron and cobalt-free glass. Other facts pointed out were: cobalt metal was stable in non-oxidizing atmospheres; however, cobalt metal was formed only in reducing atmospheres; an enamel specimen containing many well developed dendrites did not fishscale as readily as a specimen with the same bubble structure but containing no dendrites.

In elaborating on the proposed theory developed from the experimental data, Healy and Andrews pointed out that in the firing of a cobalt ground coat, the iron is oxidized at the interface between the enamel and the iron. As soon as the glass melts, the hydrogen evolved from the iron or formed from iron-water reactions at the interface is sealed in. This hydrogen is, however, rapidly consumed in the reduction of the cobalt oxide in the glass at the interface between the iron oxides and the glass to form cobalt metal, and simultaneously, in the reduction of iron oxides at the interface to form metallic iron. These phenomena account for a large part of the hydrogen which would otherwise have formed an insulating layer between the molten enamel and the iron. All of the iron oxide is not reduced to metallic iron, but an appreciable amount of it dissolves in the glass. Any iron ox-





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ide in excess of that necessary for the oxidation of the hydrogen most certainly dissolves in the glass.

The result of these phenomena, according to Healy and Andrews, is an intimate contact between the molten glass, the reduced cobalt and iron, and the parent metal iron. Cobalt and iron alloy readily and both metals conduct hydrogen ions; therefore, a glass-to-cobalt-to-iron triple adherence is present. In later firing phenomena it was postulated that further flow of hydrogen ions from the iron readily passes through the cobalt and further reduces the cobalt oxide in the glass.

* * *

Possibilities of Antimony Plating

CONSIDERABLE discussion has appeared in the past few months on the possibilities of antimony plating for finishing metal products. Recently, in "Metal Progress", Adolph Bregman suggested that antimony might be considered for a corrosion resistant surface on many parts where more critical metals are now being used, such as hardware parts, domestic ware, automotive trim, and parts in radio and radar equipment which require a high degree of corrosion protection and which must be soldered. Soderberg and Pinkerton, in discussing antimony deposits in "Plating", stated that bright deposits of antimony resemble chromium and exhibit similar resistance to tarnish by handling or in the atmosphere. Also, salt spray tests indicate protection of steel similar to that afforded by nickel-chomium coatings. At the 37th Annual A.E.S. Convention, F. A. Lowenheim, Metal & Themit Corporation, indicated that the future possibilities for antimony plating might be good because of its good corrosion and tarnish resistance, and its

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The decision of Ford's Tank Division to use hot-spray lacquer exclusively for finishing tanks at its new Livonia, Michigan, plant points up, once again, the advantages offered by this time-saving and money-saving process. This fast-drying system, developed by The Ordnance Corps., includes a new nitrocellulose base primer, MIL-P-11414 (ORD).

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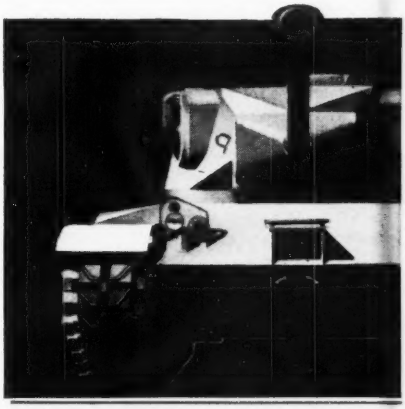

You'll want to read about the broader uses of lacquer for finishing defense items —and your own products. New military specifications for lacquer and primer are now issued and official. Identified as "Military Specification MIL-L-11195 (ORD) Lacquer, Lustreless, Hot-Spray (For Ammunition)" and "MIL-P Primer, Lacquer, rust inhibiting." Hercules will send you full information on hot lacquer, types of heating equipment available, and the performance record of hot lacquer in many industries. Send for it today.

CL52-2

pleasing appearance when polished. One point of concern among workers in the field of antimony plating has been the brittleness of the deposits produced.

Antimony has been deposited from baths containing tartrates, in which it is added as potassium antimonyl tartrate, the tarter emetic of commerce; fluorides; fluoborates or fluosilicates; and sulfides in which the antimony is present as thioantimonite or thioantimonate ion. A great deal of interest has been centered in fluoride electrolytes, typified by that of Mathers, Means, and Richard [Trans. Electrochem. Soc. 31, 293 (1917); Metal Ind. (N. Y.) 15, 197 (1917)] which uses aloin or resorcinol as the addition agent. An earlier process of Betts (Trans. Electrochem. Soc. 28, 325 (1915); U.S.P. 792,307 (1905) and a recent one of Bloom (U.S.P. 2,389,131 (1945); Brit. Pat. 559,164 (1944); 567,-794 (1945), both use antimony trifluoride (SbF_3) as the basic constituent. Bloom's work lays considerable stress on the importance of special preparation of the base metal in order to secure satisfactory adhesion of a ductile and malleable deposit.

In discussing Bloom's type of antimony bath, Bregman stated that baths comprising antimony trifluoride, ammonium fluoride, and ammonium hydroxide, in aqueous solution have produced antimony deposits possessing the most desirable characteristics of ductility, malleability and adherence. The ammonium hydroxide concentration of the bath should be somewhat less than necessary to produce precipitation.

Soderberg and Pinkerton report the successful deposition on copper or on copper-flashed steel of crack-free, almost fully bright antimony deposits from warm citrate baths containing gluconic acid and hydrogen peroxide, using soluble antimony anodes. One bath composition which was studied extensively consisted of antimony, as Sb_2O_3, 6.7 oz./gal., total citric acid 24.6 oz./gal., free citric acid 14 oz./gal., potassium citrate 19.2 oz./gal. operated at pH of 3.5-3.7. Other desirable additions recommended were 6.4—12.8 fl. oz./gal. of 50 per cent gluconic acid and 1-10 ml./l. of 30 per cent hydrogen peroxide. It was reported that a few almost brilliant antimony deposits produced from this type of bath were crack free and have remained so for several years, exhibiting only slight cloudiness.

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PRACTICAL APPLICATIONS of Modern Products

Automatic Setup for Spray Painting Shells

By A. W. GUDGE, Chief Engineer, Automatic Division, Binks Mfg. Company

THIS present emergency has once again called to industry's attention the manufacture of ordnance items. During World War II great strides were made in automatic spraying of ordnance, and in the period between World War II and now, further improvements have been made.

There are various basic types of automatic machines for spraying shells automatically. However, this article will treat only the floor-mounted chain-on-edge spindle type, which consists of the following component parts: spray booth; spray equipment; work holder and masks; conveyor.

The Spray Booth

There are two basic types of spray booths: dry and water wash. The purpose of each is to remove fumes and overspray so that operators do not come in contact with toxic or explosive fumes. With properly designed spray booths the finish of the work is not affected, whether the booth is the dry or the water wash type. However, due to the fact that an automatic

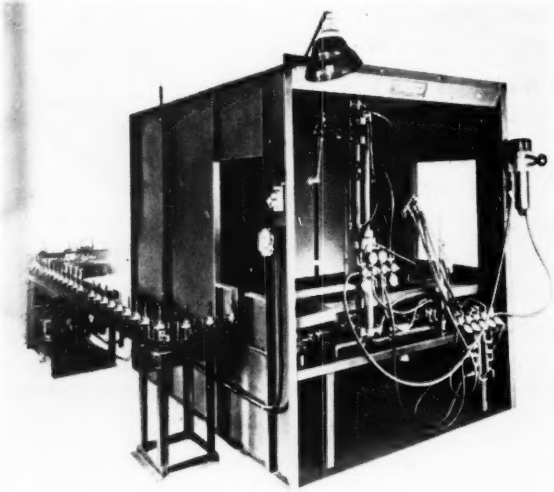


Fig. 1 — Setup designed to automatically coat the inside and outside of shells. The spindle conveyor carries the work into the painting space. The interior is spray finished by the movable gun at the left which is affixed to a double-acting cylinder unit and is mounted on an oscillating arm. The exterior is sprayed by the stationary gun unit at the right. This view also shows how an oil and water extractor (right side, front, of spray booth) is mounted close to the spraying space.

(Photo courtesy Binks Manufacturing Co., Chicago 12, Ill.)

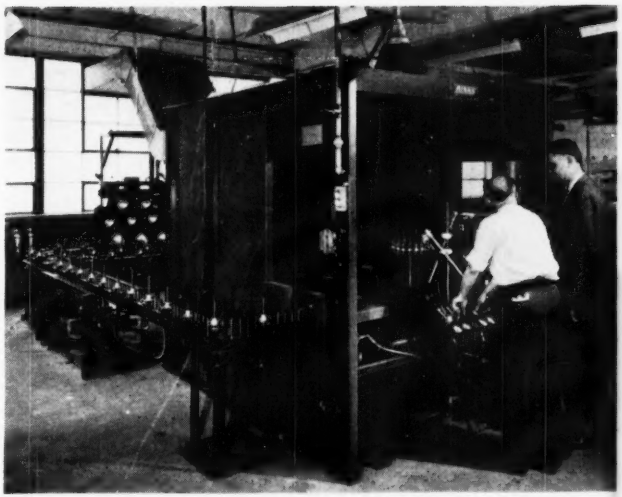


Fig. 2 — View of automatic finishing setup showing spindle-conveyor and stationary gun for spraying exterior surfaces. The stationary gun is mounted on an oscillating arm. (*Photo courtesy Binks Manufacturing Co., Chicago 12, Ill.*)

spray painting machine normally has from two to eight guns in the space usually occupied by one manual operator, the volume of spray fumes and overspray is much greater. Therefore, in most cases a water wash booth is advisable with automatic machines.

Spray Equipment

The spray equipment consists essentially of the rotating and skip spray units and the spray guns. The rotating unit rotates the work while it is in the spray area. It should have a variable speed drive so that the desired number of revolutions of the work to be sprayed can be obtained while the work is in the spray area. The skip spray unit prevents the painting of unloaded work holders, thereby saving paint and also keeping the work holders clean on those surfaces used as masks.

Stationary guns are used, in most cases, for painting exterior surfaces. The guns are held in a set position by adjustable brackets and are operated only when the work passes through the spray zone by the action of the spray control device.

In some cases it is desirable for the gun to follow along with the work, the gun remaining in a fixed relation to the object being sprayed. This unit consists of a carriage mounted on a track moving at the same speed as the work conveyor. At the end of its adjustable movement it is released from the conveyor chain and returns to its starting position. A vertical rod is mounted on this conveyor to which the gun brackets are attached so that the required gun or guns can be adjusted to the work being sprayed.

Often (as, for example, in the painting of the interior of shells) the nozzle of the automatic gun has to be inserted into the cavity in order to obtain the desired coverage. This is accomplished by mounting a double-acting cylinder or some similar device on the moving carriage described above. As the carriage starts along with the conveyor chain, the extended nozzle of the automatic gun is inserted into the cavity the desired distance and sprays on the withdrawal stroke. The speed of insertion and withdrawal should be adjustable so the desired film thickness can be obtained. Also, the points at which the gun starts and stops spraying should be adjustable so that the bottom of the cavity will not be

Fig. 3—Setup for automatic finishing of small cylindrical objects. The items being painted are shown at the left mounted on one of the spindles in the conveyor. The spray guns shown at the right are mounted on an oscillating arm. (Persons in the picture are —left: Burke B. Roche, president, Binks Manufacturing Co., and, right, A. W. Gudge.) *(Photo courtesy Binks Manufacturing Co., Chicago 12, Ill.)*

flooded and paint wasted by spraying after withdrawal of the nozzle.

A blow-out unit is required for most interior spray painting work. When the cavity of a shell is sprayed its interior is filled with overspray and fumes, which are heavier than air and have a tendency to settle to the bottom of the cavity. In addition, the sprayed film on the inner surface starts to dry, releasing more vapor fumes. If these vapors are not removed there will be a vapor wash near the bottom of the cavity. It is a simple matter to remove this vapor by a series of blasts of air. A blow-out unit should be such that the blast of air is of long enough duration to clear out the vapor. The air should be directed adjacent to one edge of the cavity opening so that the vapor can escape along the opposite edge of the cavity.

Work Holders And Masks

The work holders and masks, which are very important items in automatic spray painting, cannot be discussed generally because they have to be custom-made for each object being painted. The work holder should be designed to hold the object by one or more surfaces that are to be left unpainted. Separate additional masks are required for other surfaces that are to be left unpainted.

Conveyors

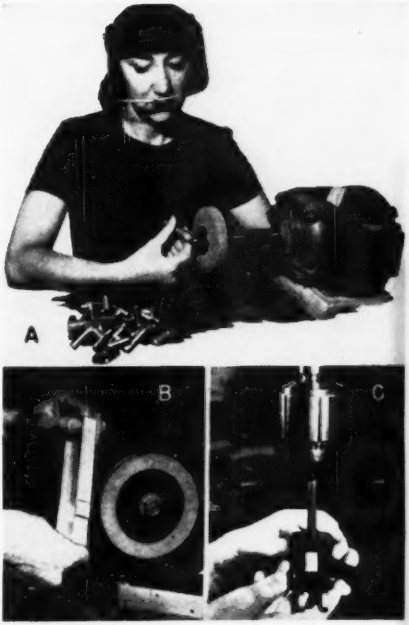
A spindle conveyor consists of a length of conveyor chain designed to permit the assembly of extended pins and rotating spindles, a number of sprocket corners including a take-up and drive, and a track to support the chain between the sprockets. The drive should be arranged so that the speed of the conveyor can be changed to suit changes in production rates within the capacity of the spraying operation.

The path of the conveyor chain can be made up to suit the purchaser's requirements. It can be arranged to pass the desired loading space, the spray booth, an air set or air dry space, and if necessary through a force dry or baking oven, and then through a cooling space to the unload zone.

Rubber-Cushioned Abrasives Provide New and Broader Concepts of Finishing

THE accelerated-production days of World War II witnessed the wide application of rubber-bonded abrasives manufactured by the Brightboy Industrial Division, Weldon Roberts Rubber Co., Newark 7, N. J. Postwar, the introduction and increased use of

Three of practically countless applications of Brightboy rubber-cushioned abrasives for machine and manual use: (A) polishing base of elbow tube (machine gun part) with Brightboy wheel; (B) smoothing and polishing stainless steel part with Brightboy wheel; (C) Brightboy rod in drill press used for burring and polishinside of guide hole.



plastics and laminated materials created still wider applications for this rubber-abrasive type finishing. Today, with defense work and civilian goods manufacture combining to set all-time labor shortages, the labor-saving applications of rubber-bonded abrasives appear to be almost without limit in burring, finishing, cleaning, and polishing lightweight and semi-precious metals — aluminum, Dural, Alclad, stainless steel, copper, silver, lead, and so on—and in finishing plastics, glass, wood, porcelain, and laminated materials.

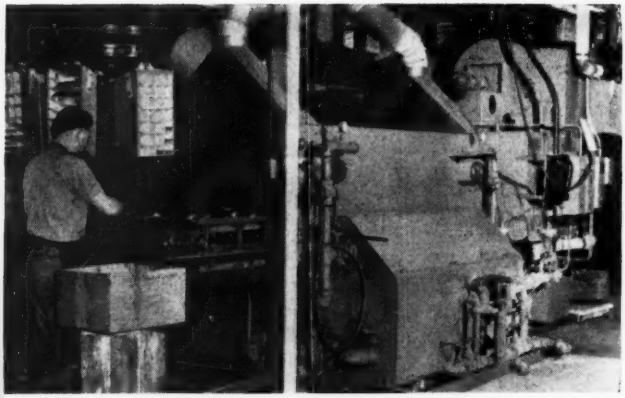
The action of abrasive-and-rubber Brightboy is unique in that the rubber gently retards or "cushions" the cutting effect of the abrasive; hence, the descriptive term "rubber cushioned." The cleaning and polishing properties of the rubber binder are, of course, obvious. The rubber binder is evenly and uniformly impregnated with the abrasive.

Brightboy rubber-cushioned abrasives are made for both machine and manual use in wheels, sticks, rods, and blocks. Surfacing is controlled by pressure and/or speed of the abrasive piece against the object being finished. Both conventional and special surface effects—damaskeening, for example—can be achieved. Brightboy can be used for close-tolerance precision work and also can be shaped to curved or contoured surfaces. Most times it will burr, finish, clean, and polish in one operation, and time-savings achieved in such one-operation bridging of work steps following the rough grind through the buff frequently amount to 50 per cent.

In addition to its wide applications in finishing products, parts, and assemblies, Brightboy is used to finish and maintain basic tools, dies, molds, jigs, patterns, machines, and parts. Special uses already proved in defense manufacture include adaptation in the production of internal combustion and jet engines, airplane parts, electrical and electronic equipment, and many types of instruments.

Machine Cleans Buffed Parts

THE efficient removal of buffing compound from polished vacuum cleaner parts is accomplished by this washer manufactured by the Industrial Washing Machine Corporation and installed

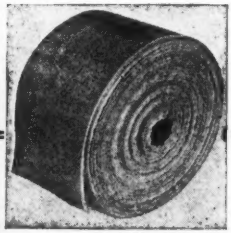


The processing machine used by the Electrolux Corporation for washing, rinsing and drying polished parts.

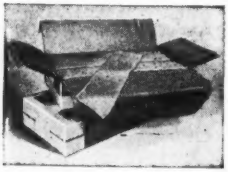
in the Electrolux Corporation plant at Old Greenwich, Connecticut.

With a high production rate of 900 square feet per hour, Model CT 36 x 10 performs the difficult task of completely removing caked buffing compound from parts with a considerable saving in labor. The machine, which occupies an unusually small area, is heated by steam. Its operation is completely automatic; it washes, rinses, and dries the work and delivers it ready for color buffing.

Due to the critical shortage of tin for plating "tin" cans, a new type of can has been developed. Made of aluminum foil, the can is fabricated by winding a strip of plastic coated foil into two or more layers, depending on requirements. Considerable stiffness is gained by this structure after it is bonded by heat.



IN ROLLS
Cut off any size piece and use as needed.



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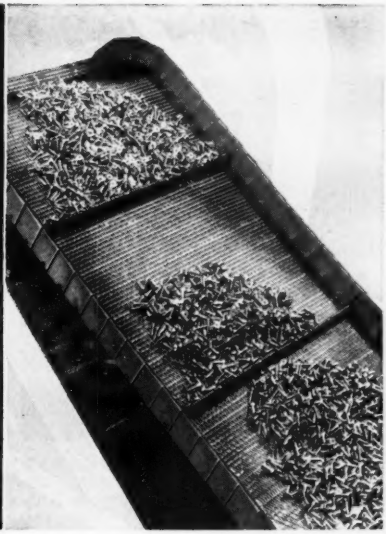
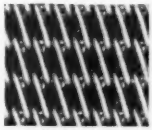
with a CAMBRIDGE WOVEN WIRE CONVEYOR BELT



If your product must be heated in any way during production . . . there's a Cambridge woven wire conveyor belt to help you reduce costs by combining processing with product movement through the heating cycle.

For example, this photo shows a Cambridge Quench Tank Belt. Other belts may be used for heat processing in temperatures up to 2100° F . . . from drying ovens and baked paint finishes through annealing, hardening and brazing.

The moving belt eliminates manual handling, helps maintain product uniformity. All-metal construction gives longer belt life and lower maintenance costs. Open mesh of the belt allows free circulation of heat within the heating chamber, free drainage of solution in wet heat processing. Special side or surface attachments to hold the product during processing are available to meet your individual requirements.



Cambridge Duplex Weave

Cambridge belts can be woven from any metal or alloy, to any mesh or weave. Next time you have a conveyor belt problem, call in your Cambridge field engineer for his experienced advice. Write direct or look under "Belting-Mechanical" in your classified telephone directory.

FREE BELT MANUAL includes information on conveyor and conveyor belt design, metallurgical data and belt maintenance. Write for your copy today.

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OFFICES IN PRINCIPAL INDUSTRIAL CITIES

NEWS of the Industry

NEW PLANTS

The new home of the **C. A. NORGREN CO.**, Englewood (suburb of Denver), Colorado, was formally opened to public inspection late in February. The unusually attractive building was shown at three open houses to business and civic leaders in the area, to customers and suppliers, and to the general public.

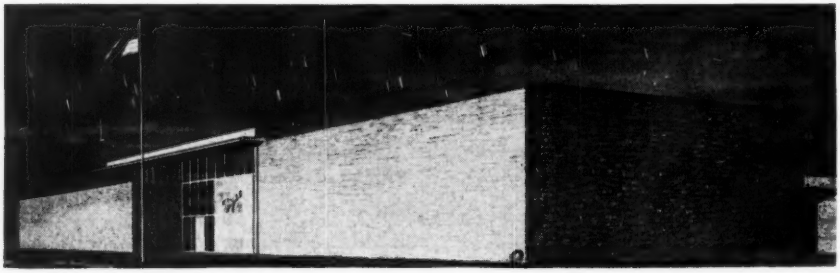
Behind its beautifully designed and constructed front elevation is a plant area of more than 2½ times the old structure. Total area of the new building is more than 60,000 square feet. The production sector is laid out on a flow plan and integrates two complete manufacturing divisions — machining and assembly, each with its own stockroom.

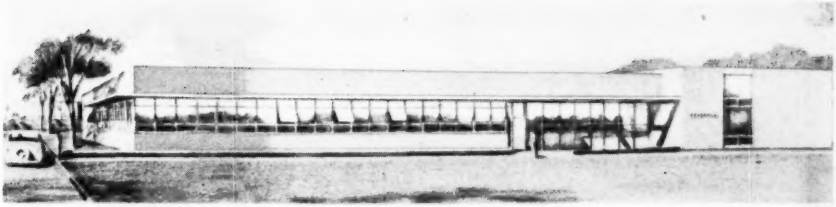
The location of the plant, adjoining Englewood City Park, makes available to Norgren employees such recreational facilities as a baseball diamond, swimming pool, golf course and driving range, and picnic grounds. A beauty feature of the plant is the magnificent 100-mile wide panorama view of the Rocky Mountains that is seen from the flagstone patio at the entrance to the plant.

THE UDYLITE CORPORATION will soon start construction on a research laboratory building on a 23-acre site on Hoover Avenue near Eight Mile Road, in Detroit, L. K. Lindahl, president, has announced. The building is the first unit of a long-term building project which will eventually house all of Udylite's manufacturing and administrative operations.

Designed to provide complete facilities for every phase of research on electroplating and metal finishing processes, the structure will cover 16,000 square feet in area. It will be a one story, contemporary-design building and will be of steel frame construction with a pre-cast cement slab roof, brick and stone masonry walls, and aluminum sash. Interior walls will be finished in glazed tile with metal and glass partitions.

New plant of C. A. Norgren Company, Englewood, Colorado





Sketch of research laboratory building to be constructed for The Udylite Corporation

Air conditioning will be installed in the office, laboratory, and library sections. Plumbing, heat and exhaust ducts will be located in below-floor access trenches or in duct space above ceiling level. The lighting throughout will be recessed fluorescent except in the pilot plating rooms and storage areas where it will be suspended fluorescent.

THE GILBERT TRAMER COMPANY has announced the opening of its new plant and offices at 1217 Main Avenue, Cleveland 13, Ohio.

The facilities of this plant will be devoted to the manufacture of all types of tanks and matal fabrications for the electrotyping and plating industries.

Another milestone in the growth of **THE SCHAIBLE COMPANY** of Cincinnati, Ohio, manufacturer of plumbing and heating equipment, was reached in February with the purchase of a plant in suburban Mariemont. The building covers 140,000 square feet of floor space and is over 600 feet long. Following remodeling and refinishing, it will house manufacturing operations and the executive offices of the company.

Beginning its business in a small way in 1932, the company today employs 850 people and has gained national recognition because of its design and manufacture of a wide line of valves, fittings, and faucets. In 1949, The Schaible Company purchased the D. T. Williams Valve Company, which began business in 1904. In the past three years the Williams line has been rebuilt, a sales organization set up, and engineering research established.

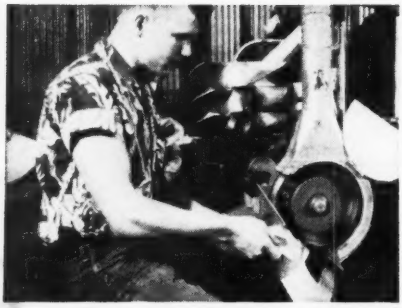
COMPANIES

Opening of a Boston branch sales office and warehouse was announced recently by officials of **MINNESOTA MINING & MANUFACTURING COMPANY.** The new building, a one-story structure featuring modern exterior and interior design, is located at 1330 Centre Street, Newton Center. Facilities include truck docks and railroad sidings.

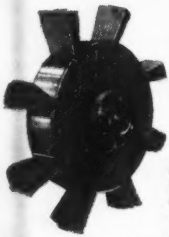
W. M. Hobelsberger, Boston office manager, said the unit is another link in 3M's nationwide expansion program aimed at improving service to industrial and retail customers across the country.

Other branch officials who will headquarter in the new office are J. H. Hargreaves, abrasives sales manager for in-

New plant of The Schaible Company, Cincinnati, Ohio

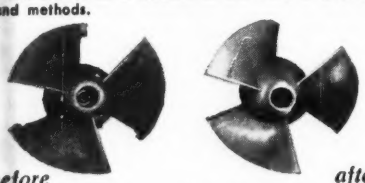


SAND-O-FLEX



eliminates hand sanding on propeller blades

A battery of Sand-O-Flex contour sanding wheels are in use at Dynamic Air Engineering Co. of Los Angeles, for cleaning up and satin finishing cast aluminum propeller blades used in aircraft heaters and blowers. Sand-O-Flex removes light burrs and flash, gets in and around the contoured hub and the pitch of the blades in a fraction of the time of previous hand methods.



before *after*

(unretouched photos)

Sand-O-Flex fastens to any turning spindle, no need for special equipment. Use it portably or stationary (as shown). A series of brushes cushion an abrasive cloth as it spins against the work piece and shapes the abrasive against the contour with a "paint brush" action. It is safe; anyone can use it—no skill necessary.

If you have a hand sanding or deburring problem, you need Sand-O-Flex. Unlimited uses on woods, metals, plastics, compositions. Specially prepared Sand-O-Flex Abrasive Refills available in a wide assortment of grits for all types of work. The Abrasive is loaded and fed out by a simple patented indexing device in a matter of seconds. Four sizes. Write for free catalog and prices.

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dustrial and refinish trades; A. S. Drew, sales manager for general line tapes; H. B. Kosanke, sales manager for retail cellophane tape; and J. E. Warner, sales supervisor for "Scotchlite" Brand Reflective Sheeting.

Announcement has been made by **TOPPER EQUIPMENT CO.**, Matawan, N. J., successor to the former Optimus Equipment Company, that it will carry on the manufacture and sale of Circo Vapor Degreasers, by which trade name Topper equipment will be known.

Vapor degreasers in a wide range of sizes are available to meet a variety of industrial and automotive metal parts cleaning operations. All the features of the Circo line of degreasers are being maintained, and in addition, a number of improvements have been included, with the result that the models represent the latest in this type of equipment.

The executive offices of the **AMERICAN ELECTROPLATERS' SOCIETY** have been removed from Jenkintown, Pennsylvania, to the American Building, 445 Broad St., Newark 2, New Jersey.

The editorial and business offices of **"PLATING,"** official journal of the Society, were also moved to the Newark address.

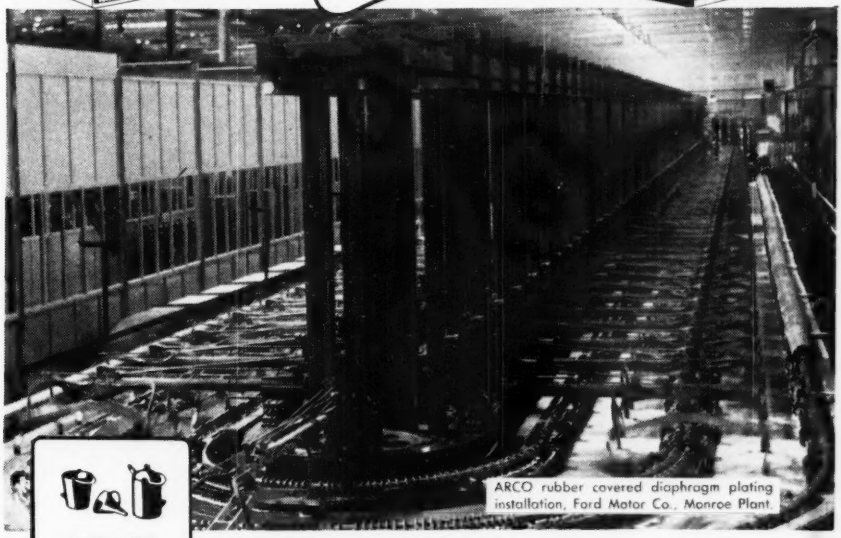
WOODBRIDGE RESEARCH LABORATORY of the Metal & Thermit Corporation celebrated its tenth anniversary with an open house on Saturday, March 1. High point of the occasion was the cutting of the birthday cake by Dr. C. Kenneth Banks, vice president of Research and Development.

The New Jersey laboratory was designed and constructed for the specific purpose of research and has been instrumental in Metal & Thermit's progress.

An exclusive license to manufacture and distribute Northrop Seal Primer No. 75, an improved type of zinc chromate primer for aluminum aircraft parts, has been granted to **THE SHERWIN-WILLIAMS CO.**, Cleveland, Ohio, by Northrop Aircraft, Inc., Hawthorne, Calif.

The seal primer was developed by Northrop Aircraft's Process Engineering

ARco
DETROIT
HOUSTON



ARCO rubber covered diaphragm plating installation, Ford Motor Co., Monroe Plant.

RUBBER COVERED UTENSILS

RUBBER LINED PIPE AND FITTINGS

RUBBER COVERED TANK GRIDS

Rubber Protected Equipment For Electroplaters

Let ARCO engineers assist you in converting to the "Diaphragm" method of plating.

● For complete details ask your jobber or write for this Diaphragm booklet.

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HOUSTON • TEXAS

AUTOMOTIVE RUBBER CO., INC.
8601 EPWORTH BLVD • DETROIT 4, MICHIGAN

Representatives of the M & E Manufacturing Company in attendance at a sales meeting. R. Egener, president, is seated center, and J. K. Stevenson, sales manager, is seated at his left.

Department, headed by Thomas E. Piper, in conjunction with The Sherwin-Williams Company Aircraft Development Laboratories. Tests conducted by Northrop indicate that this primer has good corrosion resistance.

OAKITE PRODUCTS, INC., manufacturer of specialized cleaning and allied materials, has announced the transfer of the company's general offices from 22 Thames Street to newer and larger quarters at 19 Rector Street, New York 6, New York.

Acquisition of the new office space will permit a substantial increase in the facilities of the Oakite Chemical Research and Engineering Laboratories, and is designed to assist the company in providing augmented technical advisory service to industry in connection with problems encountered in today's stepped-up civilian and defense production.

"Continued assurance of top quality, fair prices, and prompt deliveries," R. Egener, president, of **M & E MANUFACTURING COMPANY,** told Midwest sales representatives of the company's complete line of spray finishing equipment when they met for a three-day sales meeting at the M & E Co., Indianapolis, Ind., late in January.

Mr. Egener and J. K. Stevenson, sales manager, conducted the meeting, which served as an engineering refresher meeting for the representatives.

M & E's improved water wash spray booth, exhaust fans, and accessory items were discussed and information on their user benefits were highlighted.

The meeting enabled the representatives to keep better informed of the advantages of their company's products for industrial users.

NEW POSITIONS

Atlas Powder Co., Wilmington, Del., has announced the election of **WILLIAM J. WILEY** to the board of directors and to the office of financial vice president.

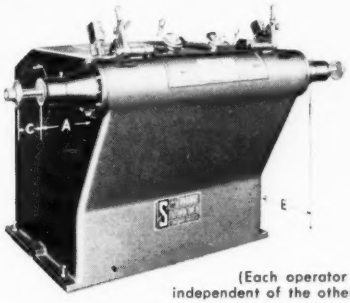
Mr. Wiley graduated from the Massachusetts Institute of Technology with a degree in engineering and from the Harvard Graduate School of Business Administration.

Hooker Electrochemical Co., Niagara Falls, N. Y., has made the following appointments:

For the Development and Research Department, **ABRAM DAVIS** has been named as a research chemist and **BERYL B. McKOWN** has been employed as a technician in the physical laboratory. Mr. Davis is a graduate of Lake Forest College and Illinois Institute of Technology. Mr. McKown formerly was associated with the Glenn L. Martin Company, Kraft Cheese Company, and more recently as a science teacher.

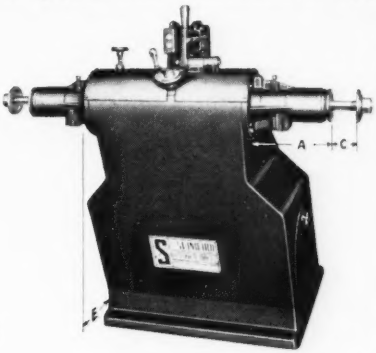
IT WILL BE THE TALK OF THE JUNE INDUSTRIAL FINISHING SHOW . . .

HERE'S PEAK EFFICIENCY THAT SAVES YOU TIME AND MONEY. These machines with their "Speedial" controls give you any spindle speed from 1500 to 3000 R.P.M., Instantly! Other speeds from a minimum of 300 R.P.M. to 5000 R.P.M.

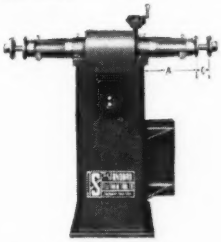


(Each operator is independent of the other.)

Type R2V. Independent Spindles Two 3 H.P., Two 5 H.P., Two 7½ H.P., and Two 10 H.P.



Type RV. 3, 5, and 7½ H.P., and 10 H.P.



Type 1BVP: 1 — 3 H.P. Available in Bench or Pedestal Model in 2 and 4 Ball Bearing Construction.

30 MODELS FROM 1 H.P. TO 20 H.P.

- **Maintains peripheral speed throughout wheel life.**
- **Gives you maximum usable wheel life.**
- **Lower production costs.**
- **Higher production.**
- **Also available in single or multiple speeds from ½ to 60 H.P.**

WRITE FOR CATALOG 44 TODAY

See us at Booths (1009-1011), International Foundry Congress, Atlantic City, N. J., May 1 through May 7

the STANDARD electrical tool co.

2518 River Road • Cincinnati 4, Ohio

HOW GOOD ARE YOU AT SELLING PRODUCT FINISHES?

WE'RE LOOKING for a young man to head up sales in a department of our business—organic coatings, including product finishes and maintenance coatings. To the right man we offer a really unusual opportunity to build up this department to its full potential, which is great. He will be well paid in the beginning, and if he succeeds, he can look forward to a rewarding and permanent future.

The man we select will have the backing and full cooperation of a well-established, 25 year old organization—rapidly growing, financially strong, stable, nationally-known. Plant in northern New Jersey. Main offices in New York City. He will enjoy attractive retirement and insurance benefits.

Frankly, we're looking for a young man "on his way up" rather than an older man who already has made his mark. He'll be somewhere around 30 years old. Right now he's probably (1) a district manager; or (2) an assistant sales manager; or (3) perhaps he's an exceptional salesman with good sales-managership possibilities. At any rate, he has much practical knowledge of organic product finishes and has had more than average success in selling them. He's the kind that isn't easily discouraged and that tackles every job with drive, enthusiasm and persistence.

If you think you qualify for this important opportunity, please send us complete information about yourself and your experience. Your letter will be held in strict confidence. Our employees know of this opening. Write in care of Rickard and Company, Inc., 11 East 36th Street, New York 16, New York.

For the Engineering Department, **THOMAS HOOKER**, a graduate of the University of Rochester and Massachusetts Institute of Technology, has been employed as chemical engineer. He previously had been associated with the Pfaudler Company and Distillation Products Industry.

Also added to the staff were **WILLIAM F. HARVEY** as mechanical engineer and **EDWARD J. KALOTA** as draftsman.

B. R. Hale

A. E. Horn, president of the A. C. Horn Company, Division of Sun Chemical Corporation, has announced the appointment of **B. R. HALE** as vice president in charge of Products Finishing.

Mr. Hale, a graduate of Lehigh University, has been associated with the A. C. Horn Company since 1930, except for four years' service as a lieutenant commander with the U. S. Navy. For the past few years he has been actively engaged in the development of protective coatings and hand-tailored industrial finishes.

LOUIS J. BAUER was appointed abrasive engineer for the Norton Company covering Arkansas, western Tennessee, Mississippi, and Louisiana, with headquarters in E. C. Blackstone Co., Memphis, Tenn. Announcement was made by Ralph M. Johnson, vice president in charge of sales.

After completing the sales training program recently, Mr. Bauer was assigned to the Worcester sales engineering office, remaining there until this appointment. He replaces Kenneth F. Ebbeson, grinding engineer, who has been handling this territory on temporary assignment.

The election of **LEON F. MILLER**, vice president in charge of sales and engineering of the Machine Division, as a director of The Osborn Manufacturing Co., Cleveland, was announced recently

by Norman F. Smith, president.

Mr. Miller, a pioneer in foundry operations, joined the company in January 1929, as a draftsman after having attended Case Institute of Technology.

Clifford T. Olsen

CLIFFORD T. OLSEN, metallurgist, has joined the sales force of Automotive Rubber Co., Inc., Detroit, Mich., according to an announcement by Robert L. Redmond, vice president in charge of sales. He will work with manufacturers in engineering, installation and placing in operation the company's rubber lined and processed tanks and other industrial equipment.

Mr. Olsen was formerly associated with Hansen-Van Winkle-Munning Company, at their Matawan, New Jersey plant. He is an engineering graduate of Lafayette College.

Henry J. Adams

Another technical service field representative has been added to the staff of the Maas & Waldstein Company, according to G. Klinkenstein, president.

Appointed to cover eastern Massachusetts, Rhode Island, Maine, and New Hampshire is **HENRY J. ADAMS.** He is experienced in the field of specialized finishes and has completed a training course in the company's research and development laboratories and pilot plant.

S. S. MITWOL has recently been appointed chief engineer, according to an announcement by the Bart-Messing Corp., Belleville, N. J., manufacturer of the line of Sel-Rex Selenium Rectifiers.

Mr. Mitwol has been responsible for many developments in the rectifier industry. He became associated with the company in 1948.

Charles N. Chalfant

The Hanson-Van Winkle - Munning Co., Matawan, N. J., has announced the appointment of **CHARLES N. CHALFANT** as manager of Industrial Cleaner Sales. The move is designed to offer expanded sales and service facilities to those industries faced with the problem of cleaning metals prior to electroplating, anodizing, painting or otherwise decorating or protecting metals.

Mr. Chalfant brings to Hanson-Van Winkle-Munning many years of experience in cleaner sales and service engineering, first with the Wyandotte Chemical Company and more recently with the Optimus Detergents Company. Background in chemical and metallurgical studies was at Carnegie Tech and the University of Pittsburgh.

The appointment of **JOHN NUBER** as assistant chief engineer and **STEWART MILLAR** as supervisor of Engineering Standards and Development has been announced by T. J. Kearney, chief engineer of Detrex Corp., Detroit 32, Michigan.

Mr. Nuber will be in charge of all technical phases of design and estimating for the company's industrial process cleaning division, which includes the vapor degreasers and alkali washer equipment.

Mr. Millar, a graduate of the University of Detroit Engineering College, previously served with Detrex in the capacity of field service engineer. His new duties as supervisor of Standards and Developments will concern design improvement of present industrial cleaning equipment, together with continuous study of ways and means of improving the design of accessory equipment for Detrex metal cleaning machines.

International Amphitheatre

The Exolon Co., Tonawanda, N. Y., has announced the appointment of **HARVEY J. ROBILLARD** as ceramic engineer. Much of his time will be devoted to assisting companies in their use of Exolon abrasive and refractory products.

A graduate of Alfred University in 1938, Mr. Robillard formerly was employed as a ceramic engineer at the Bay State Abrasive Products Company.

SOCIETIES

Latest reports on the **THIRD INDUSTRIAL FINISHING EXPOSITION**, which will be held concurrently with the **39th ANNUAL A. E. S. CONVENTION**, indicate that this show will be the largest in the history of the A. E. S. With almost all the exhibit space sold, the All-Industry Theme will be carried out to its fullest extent with members of the paint, varnish, lacquer, enamel, materials handling, industrial tapes, adhesives, metal treating, and other allied fields displaying their products and services.

Among the exhibits will be animated displays, scale, and working models showing the products in action. Of unusual interest will be an exhibit by the CEPI which will show a barrel plating and still plating line. Both military and decorative finishes will be demonstrated on these lines and plated products will be given to visitors as souvenirs. Another outstanding exhibit will be that of the A. E. S. Research Program. According to Dr. Harold J. Weisner, chairman of the exhibit committee, all project directors will be on hand to answer questions about their particular work. The exhibit will display graphs, charts, and panels which will describe the current A. E. S. research work in universities and industry.

Adjacent to the International Amphitheatre, the famous Stock Yark Inn will be available for steaks and other choice cuts; rooms may be reserved there for conferences and meetings.

Hotel accommodations are good for those who wish to be near the exhibit and for those who wish to stay in the Loop. Free bus service will be provided to and from Convention headquarters at the Conrad Hilton Hotel (formerly the Stevens) and the International Amphitheatre. For those who bring their own cars, the drive is only 21 minutes long and there is parking space for 4,000 cars in the Amphitheatre parking lot.

Chairman of the Exposition and Convention Committees is Clyde Kelly, B. Mercil & Sons Plating Company, and vice chairman is Herberth E. Head, Briggs Manufacturing Company, Detroit. Exposition direction is Lewis M. Glassner, 35 E. Wacker Drive, Chicago 1, Illinois, and Edward C. Bownan is show manager.

TRAINING COURSES

THE BINKS MANUFACTURING CO., Chicago 12, Ill., has announced the following schedule for its Spray Painting

ABBOTT

deep hardened and polished carbon steel

BURNISHING MATERIALS

for superior barrel finishing of

Military and Civilian parts and products

Abbott barrel finishing experts are ready to help you solve your burnishing problems with five scientifically designed shapes which make effective contact on parts, stampings and castings of every size and shape.

Write for details. No obligation.

THE ABBOTT BALL COMPANY
1064 NEW BRITAIN AVE.
Hartford 10, Conn. U.S.A.

School: May 7 to 11 inclusive and June 4 to 8 inclusive.

The School is especially suitable for training officials, foremen, and supervisors, and classes are limited in size so that each individual obtains maximum personal attention from the instructor.

THE FISCHER & PORTER COMPANY announces that its next instrumentation course will be held at the Hatboro, Pa. plant, May 12 through 16.

This course will cover manufacture, calibration, installation, operation, and maintenance of primary and secondary process control instruments. Users of the company's line of Flowrator instruments will find the course particularly valuable.

Further details can be obtained by writing to the company, East County Line Road, Hatboro, Pennsylvania.

MEETINGS

THE ELECTROCHEMICAL SOCIETY will celebrate its 50th Anniversary by returning to its birthplace in Philadelphia, May 4 through 8, for the spring meeting at the Benjamin Franklin Hotel. The Society's first meeting was held in Philadelphia in April 1902.

Meetings of various committees, a plant trip to the American Telephone and Telegraph Company, and a full social program will complete the extensive plans for the convention.

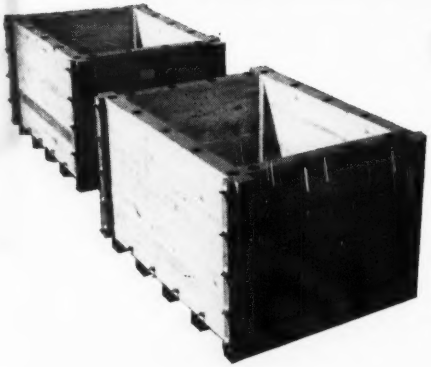
The **PITTSBURGH BRANCH** of the **A.E.S.** will hold its **ANNUAL BANQUET** at the Mona Lisa Lounge, Brownsville Road and Route 51, Whitehall, Pittsburgh, Saturday, April 19, at 6:30 P.M.

Entertainment will consist of Slim Bryant and his orchestra, door prizes, and favors for the ladies. Reservations may be made with Ken Carpenter, 108 Graham Rd., Butler, Pennsylvania.

The **TENTH ANNUAL EDUCATIONAL MEETING** and **BANQUET** of the **ROCKFORD A. E. S. BRANCH** will be held Saturday, April 19, at the Hotel Faust, Rockford.

Beginning at 1:30, the educational pro-

YOU SPECIFY 'EM ...WE'LL BUILD 'EM



PLATING and PICKLING WOOD TANKS

Don't compromise . . . don't accept plating and pickling tanks that are "approximately" what you need. Get *exactly* what you want from Kalamazoo!

Yes . . . we'll build it for you and do it at lowest possible cost. Users throughout the metal finishing industry know they can depend on Kalamazoo for standard or special size tanks . . . whether made from fir, oak, cypress or redwood.

Don't settle for less. Investigate what Kalamazoo offers you. Write for estimates and suggestions.

Kalamazoo TANK and SILO COMPANY

WOOD TANK DIVISION
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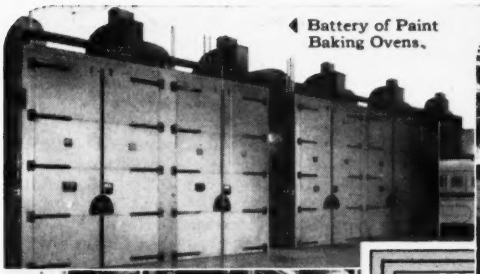
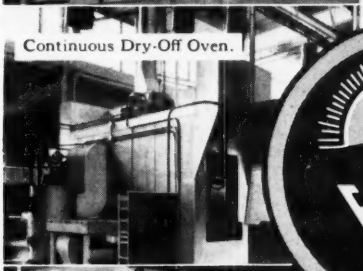


◀ Battery of Paint Baking Ovens.

A-Type Continuous Paint Baking Oven.



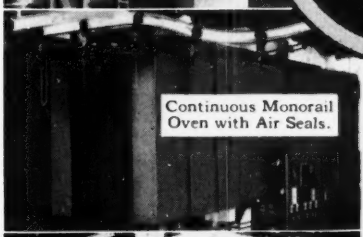
Continuous Dry-Off Oven.

LANLY

FINISHING OVENS

THE LANLY COMPANY • 770 PROSPECT AVE

CLEVELAND, OHIO



Continuous Monorail Oven with Air Seals.

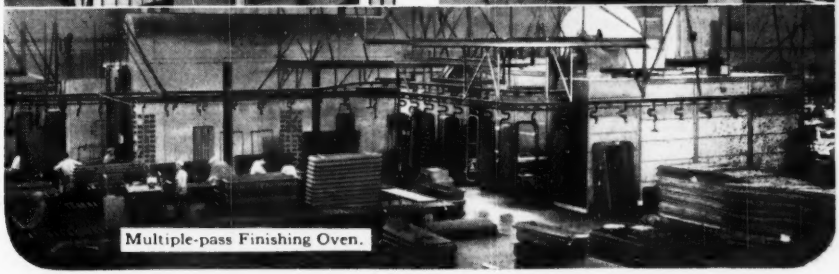
LANLY Specialized engineers are daily consulting with progressive manufacturers and meeting the need for high grade, uniform, finishing oven production at satisfactory volumes.

Continued repeat orders vouch for LANLY competence.

Complete information and literature supplied upon request.

◀ Batch-Type Oven.

Lay-Down Porcelain Enamel Dryer. ▶



Multiple-pass Finishing Oven.

gram will present Frank Clifton, General Motors Corporation, Detroit, "Present Day Substitute Finishes"; Howard J. McAleer, Formax Corporation, Detroit, "Practical Considerations in Buffing"; and Gustaf Soderberg, editor, "Plating", "Fundamentals of Zinc and Cadmium Plating."

Reservations should be made with E. J. Budden, 122 12th St., Rockford.

The **A.E.S. INDIANAPOLIS BRANCH** will hold its **NINTH ANNUAL EDUCATIONAL SESSION AND DINNER-DANCE** at the Indianapolis Athletic Club, April 26.

The educational session, which will begin at 1:30, will feature the following speakers: W. Binai, Binai & Binai, Indianapolis, "Plating With Insoluble Anodes"; S. O'Connor, Western Electric Company, Indianapolis, "Plating Room Waste Disposal"; and R. A. Fellows, Udylite Corporation, Detroit, "White Brass Plating."

Dinner will be served at 6:30, followed by a floor show and dance.

Tickets, at $7.00 per person, can be obtained by writing R. C. Bruck, Treasurer, c/o Platers Supply Co., 2311 Valley Ave., Indianapolis 18, Indiana.

meetings

OF INTEREST TO FINISHERS

Apr. 19. 16th Annual Technical Session and Banquet, Boston Branch, A.E.S., Hotel Statler, Boston, Massachusetts.

Apr. 19. 10th Annual Educational Session and Banquet, Rockford Branch, A.E.S., Rockford, Illinois.

Apr. 21-22. 34th Annual Meeting, American Zinc Institute, Hotel Statler, St. Louis, Missouri.

Apr. 26. A.E.S. Indianapolis Branch Educational Session and Dinner-Dance, Athletic Club, Indianapolis.

April 26. Annual Educational Meeting and Banquet, Milwaukee Branch, A. E. S., Schroeder Hotel, Milwaukee, Wis.

Apr. 28-30. Spring Meeting, American Oil Chemists Society, Shamrock Hotel, Houston, Texas.

Apr. 27-May 1. 54th Annual Meeting, The American Ceramic Society, William Penn Hotel, Pittsburgh, Pennsylvania.

May 4-8. 50th Anniversary Meeting, The Electrochemical Society, Benjamin Franklin Hotel, Philadelphia, Pa.

June 16-20. 3rd Industrial Finishing Exposition and 39th Annual Convention, American Electroplaters' Society, International Amphitheatre, Chicago, Illinois.

June 23-27. 50th Anniversary, American Society for Testing Materials, Hotels Statler and New Yorker, New York, N. Y.

Sept. 10-12. 14th Annual Shop Practice Forum, Porcelain Enamel Institute, University of Illinois, Urbana, Illinois.

Oct. 22-24. 21st Annual Meeting, Porcelain Enamel Institute, Greenbrier Hotel, White Sulphur Springs, West Virginia.

Nov. 17-19. 64th Annual Convention, National Paint, Varnish and Lacquer Association, Palmer House, Chicago, Ill.

Nov. 20-22. 30th Annual Meeting, Federation of Paint and Varnish Production Clubs, Palmer House, Chicago, Illinois.

Nov. 18-22. 17th Annual Paint Industries' Show, Palmer House, Chicago, Illinois.

NECROLOGY

One of the founders of the American Electroplaters' Society, **HORACE H. SMITH** passed away on February 21. A member of the Newark Branch, he served as president of the Supreme Society for two terms, 1928-1929 and 1929-1930.

An Elk funeral service, attended by a large number of A.E.S. members, was held Sunday, February 24, and was followed by a religious service on the 25th.

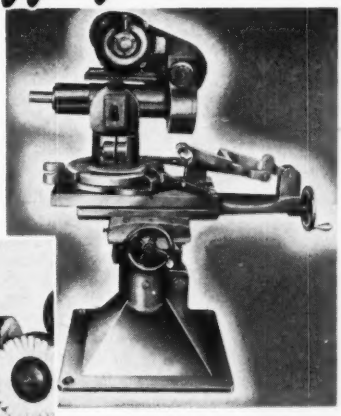
Send NOW for this FIT-ALL
DRUM PLUG WRENCH
Instantly loosens, tightens 95% all plugs or bungs in steel drums. Has 16" extra-strong steel tubing handle. Wgt. only 2 lbs. Order 1 or more today!

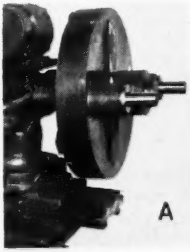
THOUSANDS IN USE saving time, labor, accidents!
SATISFACTION GUARANTEED... **$3.00**
Non-sparking type $4.60
Plus Parcel Post
MORSE MFG. CO., Inc.
125 Dickerson, Syracuse 2, N. Y.

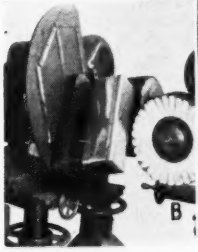
ACME *Automatic Polishing and Buffing Machines*

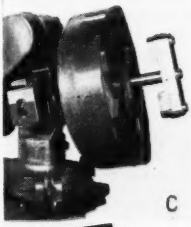
The ACME Type B-10 Semi-Automatic

This machine gives very efficient production. One operator normally operates two or more units, one at each end of lathe, loading and unloading one while the other has work in contact with wheel.









(A) Equipped with A-2 head handling parts up to 12" diameter.

(B) Equipped with Acme patented Geared Chuck; keeps rectangular or other out-of-round work in constant uniform wheel contact.

(C) Geared chuck for polishing or buffing faucet bodies. Production up to 240 pieces per hour.

This single spindle machine is used with the conventional lathe for finishing cylindrical parts. Toggle slide, vertical and cross slide adjustments permit quick set ups when changing jobs. Additional accessory equipment can be furnished for finishing a large variety of out of round parts as well as cylindrical work.

Catalogs on request

ROTARY STRAIGHT LINE SEMI-AUTOMATIC AND SPECIAL *Polishing and Buffing Machinery*

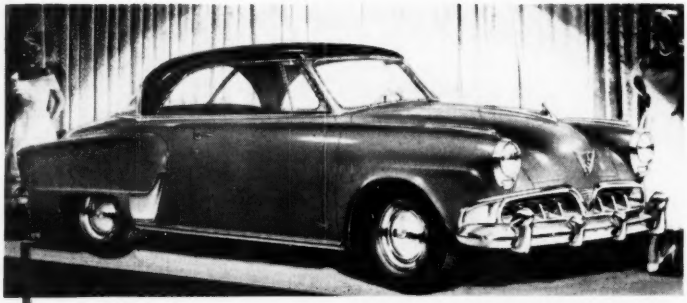
SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

Finishes



The "Starliner," a five-passenger, hard top convertible, is the pace-setter of the Studebaker line and is available in eleven different color combinations. Car bodies are phosphatized, receive two coats of primer, are water sanded, and finished with three coats of synthetic bake enamel.

(Photo courtesy The Studebaker Corp., South Bend, Ind.)

An addition to the Hudson line—The Wasp—is powered by a six-cylinder, high compression engine. The cars are finished with lacquer in seven solid colors, four special colors, or fifteen two-tone combinations. Stainless steel is used extensively for trim; however, chrome plated parts are also used on such parts as the instrument panel.

(Photo courtesy Hudson Motor Car Co., Detroit 14, Mich.)

that aid in appearance and utility

All models of Kaiser and Henry J. cars are finished with lacquer followed by baking in gas heated ovens. The range of colors for these cars include saddle bronze, cerulean blue, cardinal, blue satin, and black. Hood ornament and script on fenders are finished by chrome plating.

(Photo courtesy Kaiser-Frazer Corp., Willow Run, Mich.)

The Aero Willys is available in eight single colors and five two-tone combinations. All exterior body and sheet metal surfaces are phosphatized and then receive a double coat of synthetic baking primer and a double coat of synthetic baking enamel. A second double coat of enamel is applied to bodies, fenders, and grilles.

(Photo courtesy Willys-Overland Motors, Inc., Toledo 1, Ohio)

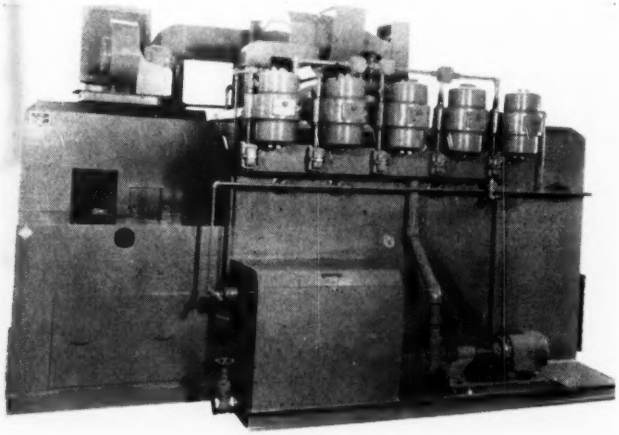
New • EQUIPMENT • MATERIALS • PROCESSES

Detrex Spirits Washer

A mineral spirits washer designed especially for one-man operation has been placed on the market by the Detrex Corp., Detroit 32, Mich. The loading and unloading of the machine has been made a simple, one-station operation by the use of a return-type conveyor.

The cleaning cycle of the unit consists of two washing stages and a forced air blow-off. Easily adjusted spray nozzles provide an even, all-over coverage of the parts being cleaned, regardless of irregularities in shape, it is claimed. As in all Detrex spirits washers, a series of safety devices are incorporated in this machine, which include: explosion-proof switches and motors, all moving parts manufactured of non-ferrous metal, a complete exhaust system, and an automatically-actuated carbon dioxide system.

The washer is said to offer a substantial saving in floor space and to provide an exceptionally high production cleaning rate. Possessing flexibility of application, it is designed to clean a variety of standard and special production parts.



Detrex Spirits Washer

"No-Prep" Vinyl Primer

The U. S. Stoneware Co., Akron 9, Ohio, has announced the availability of a vinyl primer, Tygorust, specifically developed for use on rusted steel surfaces without the necessity for previous preparation.

Easily applied by brushing, spraying, or dipping, Tygorust dries hard and can be overcoated in a matter of minutes; adheres ten-

Examples of parts blackened with Nu-Black

According to Swift, Nu-Black's operational efficiency is attributed to the process of Activanium Blending, which involves the use of several energizing agents in Nu-Black. These several energizers are said to be chosen and blended with end application in mind.

aciously to rusted steel, damp or dry; and can be used with any type of finish coating, particularly vinyls.

Under exaggerated test conditions, Tygorust has been brushed and sprayed on damp rusted panels, and also brushed on dripping wet rusted panels, with completely satisfactory results, it is claimed. Dry, rusted steel has been successfully primed without even wire brushing. For maximum results, the surface must be free of grease and oil, and loose scale should be removed.

Although the primer is fast drying, it can be applied to old, oxidized paint films (bituminous coatings excepted) without lifting or bleeding and can be safely overcoated with vinyl, nitrocellulose, alkyd, and oil-based finishes.

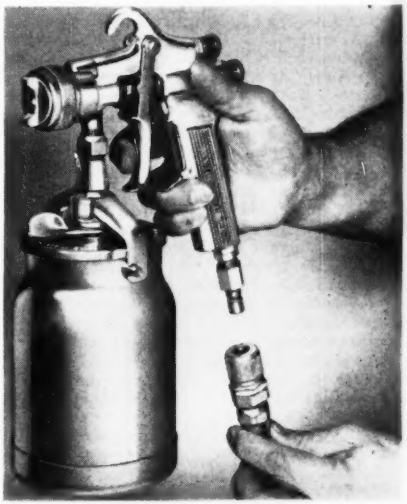
Nu-Black

A two-bath method for blackening all ferrous alloys, malleable and cast irons, and carbon steels has been perfected by the Swift Industrial Chemical Co., Canton, Conn. Designated as Nu-Black, the method is reported to be effective over a wide temperature range, creating a black surface of uniform density without bringing about any dimensional change in the piece so blackened.

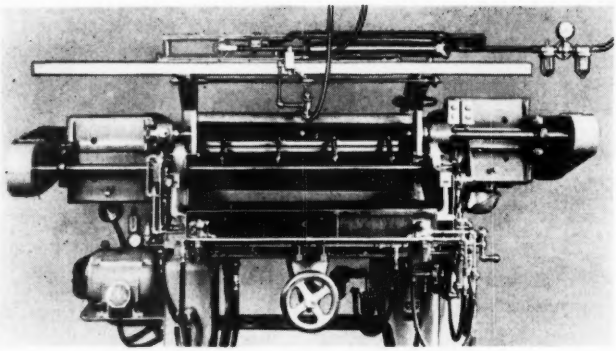
DeVilbiss Air Connector

An interchangeable and easily detachable air connector which is fully automatic and eliminates the need for shut-off valves as well as delays in production while tools are being changed or cleaned has been announced by The DeVilbiss Co., 4008 E. 89th St., Cleveland 5, Ohio. The connector is self-locking, thus preventing any air loss when detached. When coupled with both hose and tool, the air passage is opened automatically and then is closed when the connector is uncoupled.

A ball-type latch eliminates the need



DeVilbiss Air Connector



Lea Gun Mover assembly, with protective housing removed to show mechanism.

for tools in making the connection, only a slight push being required. In disconnecting, the air pressure itself is utilized to assist in detaching the insert nipple.

The connectors are lifetime devices which can be used again and again even when hose replacement becomes necessary, the manufacturer claims. Another advantage is in a swivel-type coupling which allows free rotation of the stem without tangling lines, and a far freer use of the tool.

The connection is available for five sizes of hose ranging from ¼ through ⅜ inch I.D. and four quick detachable valves in ¼ and ⅜-inch sizes with both male and female threads.

Lea Gun Mover

The Lea Gun Mover, a compressed air-operated device for the Lea Emulsion Spray Method of applying liquid compositions, such as Lea Liquabrade surface finishing compounds to wide faced buffs, has been introduced by The Lea Manufacturing Co., Waterbury, Conn. Developed in cooperation with the Clair Manufacturing Co. Olean, N. Y., it operates efficiently on any surface finishing equipment.

According to the manufacturer, the design principles incorporated in the Mover eliminate the overloading of sprayed surfaces and waste of compound.

In operation, the Lea Spray Gun Mover automatically completes one pass each time the operator trips the foot pedal microswitch. This equipment is available in a series of different sizes; the largest provides a coverage of from 2 to 40 inches with one spray gun moving at a uniform speed over a straight line traverse, which is supplied with a dependable supply of clean, dry oil-free air at all times. Incorporating an absolute minimum of moving parts, all totally - enclosed, the unit is compact and easily installed. Basic component parts include: solenoid-operated air cylinder, moving carriage with adjustable limit stops, adjustable cam-operated spray control, metal enclosure, traveling spray nozzle, foot-operated microswitch, air filter, and adjustable automatic pressure control.

Buffer Tablets

Coleman Instruments, Inc., Dept. PF, 310 Madison St., Maywood, Ill., has developed a line of buffering agents in tablet form for easy makeup of solutions for pH work in the laboratory. All that is required is to dissolve a tablet in 100 ml. of distilled water to obtain a solution of certified pH.

Available for a pH range of 2.0-12.0 in steps of 0.02 pH, the tablets are packed 12 to a vial, and are protected by a hermetic seal to ensure good keeping qualities.

Plastic Strip Finish

Development of a versatile plastic strip finish, VC-12, that is claimed to provide excellent protection against corrosion, and abrasion, and when desired can be peeled off easily like a banana skin, was announced recently by the United Lacquer Manufacturing Co., 1001 W. Elizabeth Ave., Linden, New Jersey.

VC-12 may be used on all metal surfaces. It peels off all non-porous surfaces in sheet-like form and is especially useful for these purposes, it was reported; temporary masking of objects during manufacturing operations, as in the automobile and appliance industries; lining

paint spray booths in factories; protection of the chrome plating on automobiles while in transport; protection of automobiles being shipped overseas; protective purposes in metal etching operations; and for coating fine novelty jewelry.

The finish may be applied by spraying or by brush; sets to touch in 15 minutes, and dries to packing hardness overnight, it is stated. It is available in clear and tinted clears.

Vinyl-Coated Gloves

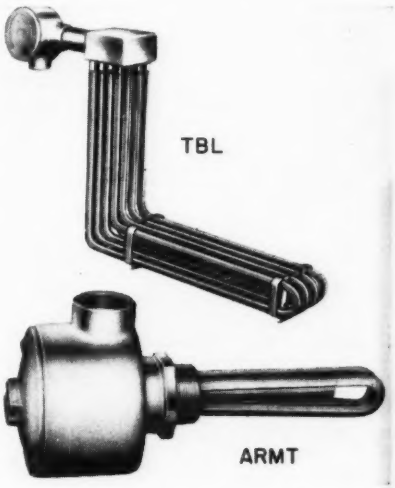
Hyflex Gloves, plastic-coated gloves which will protect against water, acids, alkaline materials, oils, and a variety of other corrosive chemicals, have been placed on the market by Houghton Laboratories, Inc., Olean, N. Y. Made by an entirely new centrifugal process, these are canvas gloves which are coated with a tough, abrasion-resistant vinyl plastisol. The application process makes possible exceptional adhesion to the canvas and freedom from pinholes, it is claimed.

Hyflex Gloves, especially suitable for use in electroplating and chemical processing, are exceptionally flexible over a wide temperature range—from freezing temperatures to as high as 200 deg. F.

Hyflex Gloves

Improved Electric Heaters

Improvement of two Chromalox industrial electric heaters used in the chemical, paint, metal working, and finishing industries has been announced by Edwin L. Wiegand Co., 7552 Thomas Blvd., Fittsburgh 8, Pennsylvania.



Chromalox Improved Electric Heaters

Design of Chromalox Type TBL electric tank heater now includes a vapor-tight terminal box as a standard feature. Heavy duty Chromalox tubular elements are welded to the sealed, electrical connection housing and the wiring is brought out to the terminal box through a thick-walled steel pipe. The new construction is intended to give longer, safer usage of the units in the presence of corrosive and penetrating vapors. Typical uses are in metal working for heating oil tempering and caustic soda degreasing baths; and in the chemical and plastics industries for heating transfer mediums such as molten salt, lead, or oil.

Chromalox TBL units are available in steel, alloy, or stainless with ratings from 3 to 7.5 kw. and heated height ranges from 11⅛ to 43¾ inches.

The Type ARMT screw-plug unit with explosion-proof or vapor - tight terminal box is now available with wider built-in thermostatic range. With brass or copper construction for water heating the range is from 50 to 250 deg. F., with steel

For more complete information on products and processes use READER SERVICE CARDS inside covers.

for oil heating it is 150 to 550 deg. F.

The safety features of this unit minimize the danger of heating near explosive fumes from gasoline, natural gas, acetone, lacquers, and so on. This type of heater is used for process heating in paint and chemical manufacturing.

The ARMT unit is available in ratings from 1.5 to 10 kw. and heated length of unit ranges from 7¾ to 48 inches.

Fluorescent Fixture Finish

Specifically designed for the finishing of fluorescent fixture reflectors, a white baking enamel is available which is claimed to offer considerably better reflectivity as well as resistance to ultraviolet rays, thus improving color retention.

An addition to the Codur line of baking enamels produced by the Maas & Waldstein Co., 438 Riverside Ave., Newark 4, N. J., the finish tends to eliminate fading in service.

Park No. 290
BLACKENING SALT

Black Oxide finishing for rust resistance and decorative parts. Speedy black coating in water solution with no electric current. Permanent black finish on ordnance parts, tools, aircraft, bearing races. Dazzling black decorative finish for television cameras, business machines, hardware, metal screens and machine parts. Excellent bond for paints and enamels. Simple one bath operation. Write for bulletin H-16. Park Chemical Co., 8078 Military Ave., Detroit 4, Mich.

Kelite R - D

Kelite R - D, a deflocculator developed to handle all troublesome paints and lacquers, has been improved so that it is now completely dustless, the manufacturer states.

According to Kelite Products, Inc., 3401 W. Touhy Ave., Chicago 45, Ill., Kelite R - D has proved a very versatile water curtain control material because not only will it handle all paints and lacquers but it will either sink or float any paint or lacquer. It also controls foam.

Ground Corn Cobs

Frank Miller & Sons, 2250 W. 58th St., Chicago 36, Ill., has made arrangements for the entire ground corn cob output of a large mill.

For use in drying, buffing, tumbling, or polishing, the product, designated as "Cob-Dri", will be available in a choice of three popular grades: coarse, medium, and fine, and will be fully dust-free and graduated to exact uniformity.

Wet Blast Chemicals

A complete line of abrasives for wet blasting machines is available directly from stock, according to the American Wheelabrator & Equipment Corp., Mishawaka, Ind. Sizes supplied range from 80 to 2500 mesh, and they are packaged in convenient 50-pound weights for easy charging of the machine and storage simplification.

American Wheelabrator is also prepared to provide from stock all the other chemicals needed for wet blasting. Anarust, the company's rust inhibitor, embodies two characteristics new to inhibitors: being in liquid form, it goes in solution immediately and it virtually eliminates staining, it is claimed.

Anaset, an anti-packing chemical, completes the company's line of wet blasting supplies.

Stirring

An attention-arousing finish on your product better reflects its inherent qualities . . . gives it individuality and sales appeal.

If you feel the coating you are presently using doesn't do just that . . . let our Creative Studio show you how it is possible to make your merchandise more eye-catching than ever.

Our staff will approach your problem with a clear, definite purpose in mind . . . create an appealing finish that fills specific needs. Reputable firms are invited to take advantage of our service at no cost or obligation. May we hear from you?

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Manufacturers of Protective and Decorative Coatings

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Roller Coating Specialists

Solve Your Glove Problems
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R-28
Hot'n Cold Glove, red DuPont neoprene. Comfort in extremes from −85° to +314°F.

Your choice of the right glove for each job can mean faster work, more production, better protection for your workers *and* lowest per hour glove cost. No one glove is right for every job! PIONEER'S new Stanzoil catalog shows you how to choose the right glove for each job. *Unbiased advice—Stanzoils include all kinds of liquidtight gloves:* all-neoprene, neoprene, and vinyl-coated. 32 styles, weights, sizes. It pays you to select gloves scientifically. Write for your Stanzoil catalog today!

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The PIONEER Rubber Co.
685 Tiffin Rd., Willard, Ohio

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OVER 30 Years OF QUALITY GLOVE MAKING

P.S. If your glove problems are unusual because of the nature of your product finishing operations, PIONEER welcomes the opportunity to help you solve them. Write us about your needs and problems — you'll save money, improve your glove service.

Belgrade Glue

The Hanson-Van Winkle-Munning Co., Matawan, N. J., has announced an improved high-strength glue especially compounded for binding the abrasive to the surface of metal-polishing wheels.

The glue, known as Belgrade Glue, has improved water absorption qualities which result in greater quantities of prepared glue from each pound of dry glue, it is stated. In addition, the glue has the proper viscosity, flexibility, and strength characteristics required to prevent abrasive from tearing loose while the wheel is in operation. Abrasive waste is decreased and the number of setups required is reduced.

Belgrade Glue is a hide glue supplied in ground form and packaged in barrels and 100-lb. boxes.

Plastic Protective Coating

Munray Products, Inc. has developed a "putty-like" plastic paste for the protection of the outside surfaces of plating rinse tanks from acid spillage, plating salts, and other corrosive chemicals. Easily applied with a hand trowel, it can be spread on any desired surface and to any thickness. In the case of plating tanks, the coating is usually $\frac{1}{16}$ to $\frac{1}{8}$ inch.

This coating compound is made by adding a gelling agent to a paste based on Geon 121 vinyl resin, a product of B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio. Besides resisting most acids and chemicals, Geon has good resistance to oils, greases, abrasion, and aging, it is stated.

Fusing the plastic putty coating is done either by oven baking or infra-red lamps. It will reach a Durometer A hardness of 90-95. Because it contains no volatile materials, it can be applied safely, and there is no change in viscosity during storage, it is stated.

McKeon's
"Liquid Sulphur"
FOR COPPER STRIPPING NON-DANGEROUSLY
Economical, Non-Electrolytic.
No special equipment required.
Write for descriptive brochure.
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STRAND equipment enjoys an enviable reputation for quality . . . you can buy it with confidence. It is sold through distributors in major cities.

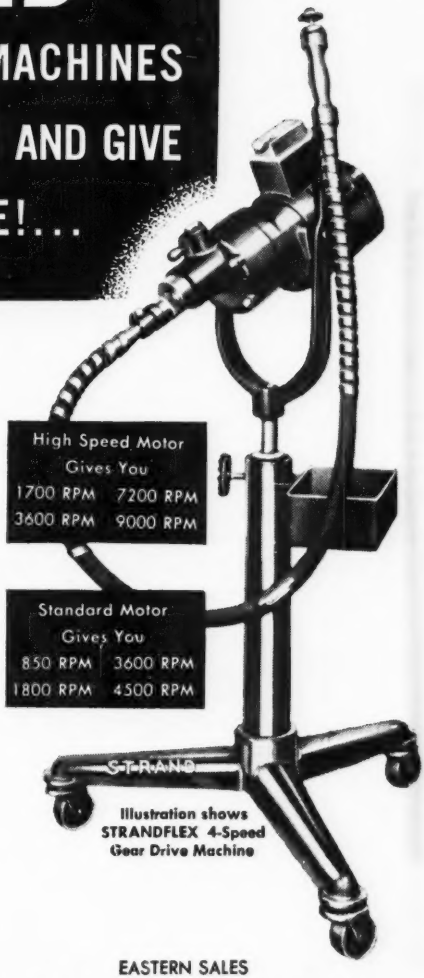


Illustration shows STRANDFLEX 4-Speed Gear Drive Machine

The Balmar Corporation
N. A. STRAND DIVISION

EASTERN SALES
Woodberry, Baltimore 11, Maryland

WESTERN SALES
5001 North Wolcott Ave., Chicago 40, Illinois

Surface Active Agents

Two surface active agents, one a paste and the other a flake product, designated as Sorbit, have been announced by the Alrose Chemical Co., 180 Mill St., Cranston 5, R. I. The materials act as sequestering agents for calcium, magnesium, copper, nickel, zinc, and tin ions, rendering salts of these metals soluble. They also act as solubilizers, it is stated, causing many organic materials to become soluble in water.

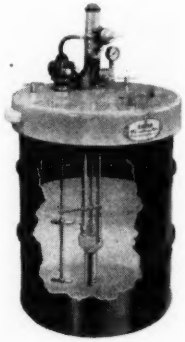
Some suggested uses for Sorbit in the metal finishing field are in alkaline cleaners where they aid in skimming soil and debris from the bath surface, and as a penetrant in phosphoric and oxalic acid type derusting agents.

Graco Heavy-Duty Paintmaster

A Heavy-Duty Paintmaster featuring an extra powerful, air-operated pump for easily handling in volume the new-type coatings, extremely heavy paints, and many other fluids has been announced by The Gray Co., Inc., 1010 Sibley St., Minneapolis 13, Minn. The air-operated, double-action, reciprocating pump is specially designed to have greater volume and pressure for supplying long-line circulating systems and multiple spray guns.

The circulating system in the Heavy-Duty Paintmaster delivers paint directly to the spray head and back through the supply lines.

The dual-blade, air-operated rotary agitator features twin blades adjustable to any depth. A micrometer-type adjustment provides a full range of agitating speeds independent of paint pump operation which keeps paints thoroughly mixed at all times.



Graco Heavy-Duty Paintmaster

The heavy gauge steel cover fits all full-size, open-top drums, it holds pump securely in place, allows effective cover-to-drum seal. Three hand screws permit adjustment of pump in drum.

Important safety advantages are claimed. In a circulating system, fire hazards can be greatly reduced if the units are housed in a fire-proof paint control room. Explosion hazards due to excessive air pressures are removed because no pressure vessel is used.

Sly Dust Filter

The Dynaclone, product of The W. W. Sly Manufacturing Co., 4800 Train Ave., Cleveland 2, Ohio, is a cloth-type filter for collecting industrial dusts from various operations. Its principal features are uniformly maintained suction and removal of dust from filter bags by reversing the air flow.

The fan on the system puts the collector housing under suction. A traveling device moves across the open end of the filter bags. This device has an air tube to the atmosphere, and the suction on the housing causes air to enter the traveling device and flow through one bag at a time in reverse direction, causing the dust on

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Use 4A Cement and Thinner—For Setting Up Wheels, Belts, Rolls, etc. — Longer Life — Greater Production.

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BEDE PAINT HEATERS

★ First Choice Among Leading Manufacturers

Turn finishing waste into profits! With the amazing hot-spray method, using Bede Heaters, you get higher quality finishes. You cut loss from rejects. Faster production permits more jobs without costly additions of equipment. You save paint waste and cut thinner bills more than half.

Bede Paint Heaters are quickly and easily installed in any finishing operation. They require no major changes or additional equipment. Paint temperature and viscosity are thermostatically controlled by heating elements housed in cast aluminum. Proved by thousands of installations, there is a Bede model best suited to every industrial finishing requirement.

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An Ounce of IMMUNOL

ELIMINATES WATER STAINS

An ounce of IMMUNOL added to every ten gallons of water in your final rinse will prevent the formation of water stains on plated parts without any other changes in your present plating or rinsing cycle. The combination in IMMUNOL of the properties of instant wetting, surface degreasing, rust prevention and complete rinsability even in the hardest water prevents rinse water from coalescing on rinsed parts and assures complete removal of any last traces of impurities which might cause staining. Bright finishes are protected and unmarred and subsequent buffing is unnecessary.

IMMUNOL is a neutral, non-ionic liquid perfectly safe for plated parts, and its additional features of being non-toxic and non-inflammable make it equally safe for your plant and workmen too.

For the complete story of IMMUNOL and the countless other industrial applications it possesses, send for our illustrated booklet.

Haas MILLER Corp.

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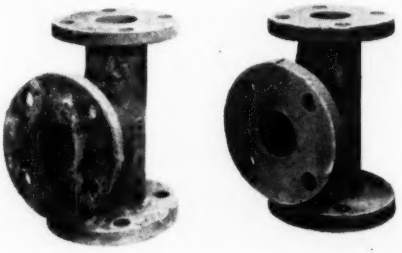
the outside of the filter bag to loosen and drop off. Constantly cleaning all the filter bags in this manner, according to the manufacturer, assures uniform suction at the dust sources.

"Rustclean" Chemical Treatment

A chemical treatment that removes rust, tarnish, and light oil, chemically prepares metals for paint, and retards corrosion has been announced by Oct-



The pipe tee, shown at left, before cleaning treatment and at right, after Rustcleaning.

gon Process Inc., 15 Bank St., Staten Island 1, N. Y. Known as "Rustclean," the compound destroys rust and rust-promoting surface contaminants, thereby retarding corrosion. It chemically cleans the surface of steel, iron, aluminum, zinc, and cadmium, and also forms a phosphate coating which acts as a base for organic finishes. It is also an effective tarnish remover for copper and its alloys, it is claimed.

Several types of Rustclean are available, each designed for different work. Rustclean 12 is designed for a wipe-on process for large parts or in plants where equipment or production is limited.

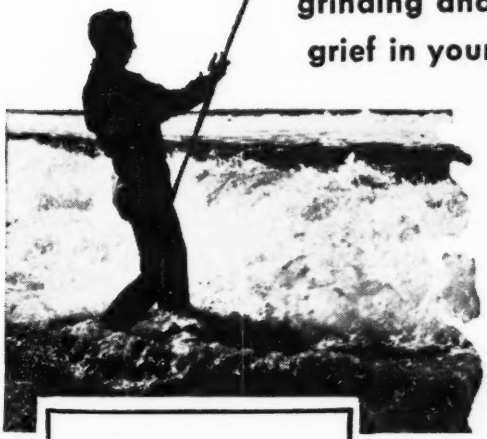
Rustclean 15 is a more concentrated compound which is used in an immersion process in a stainless steel vessel or tank lined with rubber, polyethylene, or asphalt. It is most effective when used at a temperature above 160 deg. F., it is stated.

According to the manufacturer, Rustclean is safe to use. Containing only a mild acid, it does not have the corrosive action of strong pickling compounds, does not fume or emit toxic vapors, and may be used in the same area where steel is finished or stored. It meets all military specifications, and is marketed in special grades for close tolerance work.

Surf fishing's

FUN on the sands of the seashore, but . . .

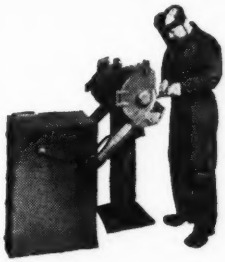
the sands From industrial grinding and polishing means grief in your plant . . .



STOP THEM WITH

TORIT

DUST COLLECTORS



Torit Dust Collectors are available in both cabinet and cyclone types. They range in size from ½ to 5 H.P. and up to 2,100 c.f.m.

When industrial *sands* pollute the air in your plant, your workers think of going fishing. Production lines get snarled with rejects, and the day's *catch* won't be up to the legal limit.

Torit Dust Collectors are compact, self-contained units for capturing and cleaning dust laden air from industrial machines. They are economical to install, efficient in operation and fit easily into present and future production set ups.

Torit Dust Collectors are available in many models and sizes, and special adaptations can be fabricated in our own shops. For complete information and the latest Torit catalog, write:

TORIT MANUFACTURING CO.

314 Walnut Street **St. Paul 2, Minn.**

Paint Booth Conditioner

PB-1, a conditioning agent for industrial paint spray booths, has been developed by the Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pa. A highly alkaline, anhydrous, free-flowing, dust-free material containing non-foaming agents, it is used in the water circulating system and is designed to prevent adhesion of paint to the curtain wall and to assist the water cascade in preventing escape of paint into the atmosphere. Production tests show that even under prolonged operation the conditioner prevents clogging of nozzles, louvers, baffles, and return lines.

Investigations conducted on a number of paint formulations reveal that PB-1 precipitates some types of paints on the surface of the water reservoir, thus permitting easy removal for subsequent disposal or reclamation.

Save Time, Labor, Dollars!

TEST • STUDY • CONTROL

VISCOSITY

As Simply, Quickly and Easily as Taking Temperature Readings

Just a flick of a switch, then read the Brookfield dial, and you have your viscosity determination in centipoises. The whole operation, including cleaning up, *takes only a minute or two.*

Available in a variety of models suitable for extremely accurate work with both Newtonian and non-Newtonian materials, Brookfield Viscometers are portable and plug in any A.C. outlet—*can be used in Lab, Plant or both.*

Write today for fully illustrated catalog showing Brookfield Viscometers adaptable to any viscosity problem *from less than one to 32,000, 000 centipoises.*

Brookfield ENGINEERING LABORATORIES, INC. 282 Porter St., Stoughton, Mass.

Universal pH Meter

Universal pH Meter, precision built for reliable service and for quick accurate measurements of hydrogen-ion concentrations, is available from the North American Philips Co., Inc., 750 S. Fulton St., Mount Vernon, N. J. The instrument is designed for all pH and rH work, for potentiometric titrations, and for oxidation-reduction-potential investigations.

For laboratory research and industrial testing purposes, it is claimed to provide a measuring accuracy of 0.01 pH or 0.5 m. v., a range of 0-14.15 pH and 0-1415 m. v., absolutely currentless measuring with no phenomena of polarization, zero indication by cathode ray tube, can be used with glass, quinhydrone, hydrogen, and platinum electrodes, and is direct calibrated for the first three.

The pH Meter is supplied with the removable Philips calomel and glass electrode and is provided with controls which correct for temperature variations for asymmetric potentials. The unit has a built-in Philips cadmium standard cell and a flexible cable with a plug for connection to a 60-cycle a.c. current.

Stain-Resistant Masking Tape

Behr-Manning, Troy, N. Y. (Division of Norton Company), has announced the addition of a masking tape to its line of Behr-cat Brand pressure sensitive tapes.

Identified as No. 115 Stain-Resistant Masking Tape, it is specifically designed for use on lacquered, enameled, painted, and porcelained surfaces where color separation, masking, packaging, and holding functions are required; that is, kitchen cabinets, ranges, refrigerators, automotive painting, and so on.

According to the company, it is particularly effective on white, off-white, and light pastel colored surfaces where the chemical reactions of regular type masking tapes have a tendency to stain immediately or with age due to storage or delayed transportation.

The facilities of Behr-Manning Corporation research laboratories are availa-

For all fine finishes Use

TACK "*Magic*" RAGS

WM. A. JUERGENS CO. *Write for Sample* 4036 LAGRANGE ST. TOLEDO, OHIO

Easier, smoother break-in, longer subsequent wear

Get over the hump of break-in with the friction parts of an engine and you've got a big trouble-source eliminated. And that's one thing Parco Lubrite does—it prevents scuffing and scoring during break-in operation. The Parco Lubrite coating, non-metallic and integral with the metal, is oil-absorbent and maintains lubricant in the tight fit of new parts and so assures easy and smooth operation.

The Parco Lubrite coating promotes longer subsequent service because the parts wear in easily to close mating of parts and bearing surfaces.

Treatment of parts with Parco Lubrite is a chemical process which produces results of uniform, high quality and operates with simplicity and efficiency.

For full information about Parco Lubrite, write for free technical bulletin.

* *Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

Parker *RUST PROOF COMPANY*

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BONDERITE—corrosion resistant paint base • ***BONDERITE and BONDERLUBE***—aids in cold forming of metals • ***PARCO COMPOUND***—rust resistant • ***PARCO LUBRITE***—wear resistant for friction surfaces

ble for discoloration and accelerated aging tests. Invitation is extended to forward panels or samples of the finishing agent that is to be exposed to pressure sensitive tape application.

Metal Parts Washer

Product of Super-Soak Co., 3770 S. Pennsylvania Ave., Milwaukee 7, Wis., the Super-Soak Metal Parts Washer, illustrated herewith, is described as a simple, automatic, active soaking type unit which includes a tray that provides a "swishing" and positive cleaning action. The design comprises a heavily constructed steel plate tank (cover attached) equipped with a ¼ h.p. single phase electric motor operating a simple gear-driven mechanism attached to the loading tray. The mechanism is arranged to automatically and slowly lower and raise the tray into and out of the soaking solution which can be used either cold or hot.

Super-Soak Metal Parts Washer

According to the manufacturer, this slow dunking action combines two positive cleaning methods—a "chemical" action during the soak in the solution and a "swishing" and washing action as the loading tray slowly operates into the solution. The combined action is said to loosen and then remove grease, dirt, oil, scum, and other foreign materials. Aggravation of the sludge on the bottom of the tank is said to be eliminated since the tray stops within 3 inches of the bottom.

Cut Wire Shot

Park Chemical Co., Military and Vancouver Aves., Detroit 4, Mich., has developed its Cut Wire Shot for use in tumbling barrels for deburring and cleaning or to impart a desirable finish, and also for peening or shot cleaning steel forgings, castings, and heat treated parts.

Uniform in size and composition and claimed to be exceptionally durable, Park Cut Wire Shot is produced by clipping carbon steel wire into small pieces whose lengths equal their diameters. It is available in sizes of 0.023, 0.028, 0.032, 0.035, 0.041, 0.047, 0.054, and 0.062 inch with tolerances of plus or minus 0.002 inch.

Rust-Inhibiting Metal Cleaner

Pennsalt EC-51, a rust-inhibiting organic-type metal cleaner, has been announced by the Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia 7, Pennsylvania.

Newest addition to the Pennsalt line of emulsion cleaners, the product combines powerful detergent action with a high degree of rust protection, it is claimed. Steel parts cleaned in Pennsalt EC-51 obtain protection from rusting for up to six weeks under normal plant conditions. Even under unfavorable conditions, protection for two to three days can be expected, it is stated. The cleaner is equally efficient in removing soil from all of the non-ferrous metals without staining or etching.

Developed at Pennsalt's Whitemarsh Research Laboratories, the product has been field tested in a number of metal processing plants. In addition to providing cleaning and rust inhibition in a

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FRESH SUPPLY AVAILABLE

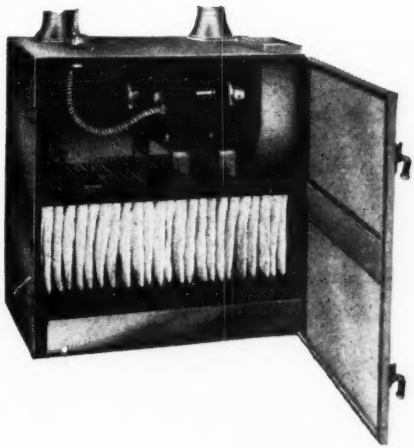
KEYSTONE EMERY MILLS *Write for Sample* **4316 Paul St., Phila., Pa.**

HUSKY and FAST!

Long trouble-free service and ease of operation are the prime requisites for equipment of any kind.

HISEY Buffers - Polishers embody these features to such extent that they afford lowest cost per year with maximum production.

They are made from small bench types up to 30 H.P. Pedestal types. There is a size and type particularly suited to your requirements. Let us show you.



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These new HISEY Dust Collectors fill a long felt need for efficient dust collecting at reasonable cost. They are made in four sizes which cover most applications and can be supplied with new machines or for machines already in service.

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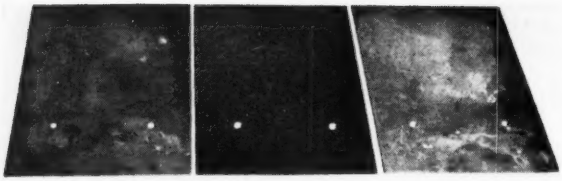

Illustration shows panels after three weeks of normal plant exposure. The middle panel, which had been cleaned in Pennsalt EC-51, showed no signs of rusting. The other two specimens, cleaned in other cleaners, rusted after two days under the same conditions.

single operation, EC-51 has also proven highly successful in cleaning prior to painting.

Pennsalt Cleaner EC-51, which is non-caustic, non-explosive, harmless to the hands, and does not create toxic working conditions, is used in concentrated or diluted form and can be applied by both spray and immersion methods. In spray cleaning, a dilution of from 50:1 to 100:1 will apply to most cleaning and rust protection applications encountered in industry.

Respirators

A line of four respirators to provide maximum protection, comfort and service is being offered by The DeVilbiss Company of Toledo, Ohio. Two types are available, each incorporating thoroughly proven principles to meet the varying degrees of protection required.

In addition to a new filter and a new cartridge respirator, The DeVilbiss Company is offering two Bureau of Mines approved respirators, one for protection against dust and the other model which safeguards against fumes and vapors.

The MSC (cartridge) and MSF (filter) have wide usage, it is stated. The former protects against low concentrations of light organic fumes; vapors and gases encountered in spray painting, degreasing, and similar operations. The latter is used for protection against light concentrations of nuisance dusts produced in some grinding operations.

Model MSE (double cartridge), which also has the approval of the Bureau of Mines, protects against low concentrations of light organic fumes, vapors, and gases encountered in spray painting, degreasing, and similar operations. It is usable in the presence of benzene, zylene, toluene, gasoline, naphtha, acetone, turpentine, and other fumes of this type.

PRODUCT LITERATURE

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning PRODUCTS FINISHING when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Thermohms. The entire line of general-purpose and specialized Thermohms (resistance thermometers) that are being used in countless plant and laboratory applications to detect temperatures between —325 and +1000 F. with accuracies from ±0.018 to ±3.0 deg. F. are fully described and illustrated in a 36 - page catalog and buyer's guide. "Thermohms, Assemblies, Parts and Accessories", pub-

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lished by the Leeds & Northrup Company.

Included in the catalog are photographs and the complete specifications for every available Thermohm, from the well-known copper, nickel, and laboratory platinum types to the latest industrial platinum type. Accessories and replacement parts are grouped with the related Thermohms, and specifications are presented in tables so that the reader can easily compare Thermohms of the same type.

A copy of **Catalog EN-84** will be sent upon request to Leeds & Northrup Co., 4934 Stenton Ave. Philadelphia 44, Pa.

Testing Instruments for the Paint and Other Industries. For quick and ready reference, descriptions of the 80 items made or sold by Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md., are presented in abstract form in its 36-page **1952 General Catalog.** In most instances illustrations are included, together with a price list. Some of the conditions and characteristics that can be determined with these instruments are viscosity, resistance to abrasion, film thickness, gloss, appearance, and color.

Powerful, direct-connected (no gears), 3450 r.p.m., 100-120 v AC air-cooled motor. All sealed ball-bearing construction. Die-cast aluminum housing, polished. All-position handles. In hand weight only 5 lbs. Insulated with ground wire for wet as well as dry sanding or rubbing. Available accessories—deep contour pads, surface plates, felts, etc. Takes any sheet abrasives—3 covers 4½" x 6½" from standard 9" x 11" sheet.

A time saving quality tool priced so every worker can have one.

Write for Circular

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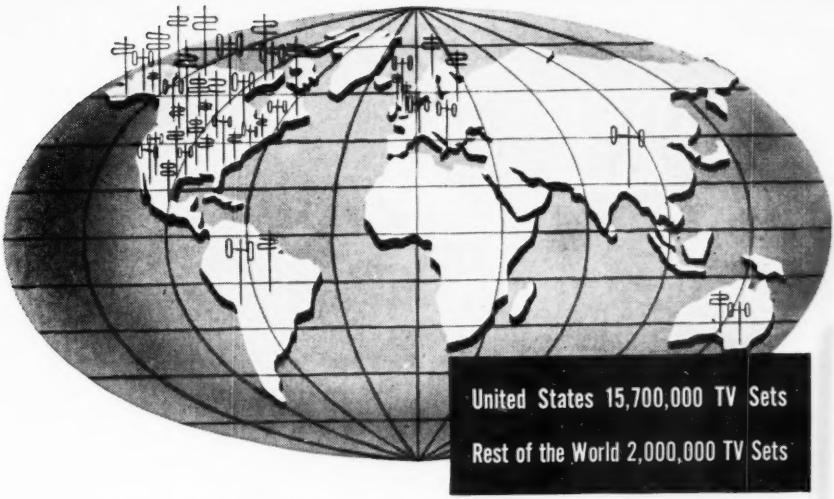
Iron and Steel Blackening Compounds. A four-page bulletin has been released by the Swift Industrial Chemical Co., Canton, Conn., which presents detailed information on the company's Activanium-Blended blackening compounds.

Such products as Nu-Black, Ultra-Black, and Gamma-Black, which are applicable to dies, chains, cutters, screws, and gears, are fully discussed .

Also available are catalogs on Swift Rust Resisting Compounds and Swift Metal Cleaning Compounds.

Flow Meters. A 40-page bulletin describing the company's "Series 500" line of Flow Meters has been published by The Bristol Co., Waterbury, Conn. The bulletin, **No. F1605,** describes instruments for recording, integrating, indicating, automatic controlling, and telemetering the flow of steam, water, air, gas, oil, solutions, and other fluids. Both mechanical and electric-type flow meters are described in a full range of models suitable for a wide variety of uses. Complete information is given on the various types of meter bodies, operating principles, primary devices for flow measurement, recording charts, and accessories.

Hankison Model B-30 Condensifilter, a device which dehydrates and cleans compressed air used for operating instruments, is detailed in **Bulletin B-30** published by the Hankison Corp., 373 Renton Bldg., 1501 Beaver Ave., Pittsburgh 33, Pa. Measuring only 15 inches high by 9 inches in diameter, the Condensifilter, in a single compact unit, combines a mechanical filter, a dehydrator, and an automatic trap. When connected to a compressed air line, it removes entrained and vaporized water and oil, oil sludge, scale, and other foreign materials from the air. Rated capacity is 30 c.f.m. at 100 p.s.i.; but several units can be installed in parallel.



COMPETITION Turns Luxuries into Necessities

Two millions of people throughout the world, washing machines, radios and television sets are miraculous inventions remote from their lives . . . for the wealthy only.

In the United States, however, a new product appears in no time in the homes of wage earners as well as salaried executives.

Consider television, for example. Only 6,500 sets produced in 1946 . . . over 5,000,000 in 1951. Or washing machines . . . more than 24,000,000 in 10 years.

What has Competition to do with this?

Do you think we'd continue to get more and better products if only one company made each item or each line?

No! We get more and better products here in America, because anybody who thinks he can make anything better or sell it more efficiently is free to try.

And many succeed. Take electrical products like radios and television sets . . . and home appliances like washing machines and electric fans. Does the biggest company monopolize this industry? Not by a long shot! Even counting all its affiliated companies, it still sells less than 1/5 of such products bought in this country.

There are nearly a thousand other companies that make home appliances, radios and television sets. And they do more than 4/5's of the business! The smallest of them make the biggest companies hustle their bones to keep making products better and better.

In America, a better product can always win consumer acceptance in any field.

Let's keep the COMPETITIVE SYSTEM working for us

The Competitive System can be killed! When industries are run by government, when taxes are so high that they destroy the incentive to work hard and risk savings in business ventures, the Competitive System languishes and dies.

You've seen it happen in other lands. Let's not let it happen here.

Let's all of us watch closely to see that those who represent us in government are working with us and for us to preserve our Competitive System; to assure a tax structure that leaves enough incentive to make hard work worthwhile, so that *any* man with ability and energy has a chance to earn good money and keep most of it.

Competition thrives best where the rewards are high. People live best where competition thrives.

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THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER OF PEOPLE

Barrel Finishing Compound, a chemical in highly concentratrated paste form for descaling, roughing, deburring, cleaning, and finishing brass, bronze, copper, gold, silver, and certain other non-ferrous parts by barrel tumbling, is the subject of **Bulletin No. 1** released by the Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24, Pa. Included are case histories of time savings and improved product quality.

Alumaloy Laboratory Clamps, available from Laboratory Industries, Inc., 4710 W. North Ave., Chicago 39, Ill., are the subject of an enlarged 12-page catalog. Included are four additional pages of Alumaloy clamping devices and other laboratory items, such as magnetic stirrers with Teflon-covered magnets, electric stopwatches, and carboypumps. Well illustrated, the catalog gives detailed descriptions of the various laboratory devices.

Barnstead Bantam Water Demineralizer. Bulletin No. 124 describes Barnstead's Water Demineralizer for laboratories, which connects directly to any water supply and delivers the demineral-

ized water in continuous flow from 5 to 8 g.p.h. Its seven new features are completely described in the bulletin, which may be obtained by writing to the Barnstead Still & Sterilizer Co., 130 Lanesville Terrace, Forest Hills, Boston 31, Massachusetts.

Multakolor. A four-page descriptive bulletin on Multakolor, a multi-color enamel finish which makes possible the application of two or more colors in a single coat, has been issued by the United Lacquer Manufacturing Corp., Dept. MK, 1001 W. Elizabeth Ave., Linden, N. J. Listed are the methods of application, recommended spray guns and accessories, cleaning equipment, specifications, materials covered, drying times, finish, coats, colors, and storage conditions.

Concrete Floor Problems. A folder in which industrial floor problems are analyzed and suggestions given for providing a walkway surface that offers a high resistance to slipping under a wide variety of service conditions can be obtained upon request from The Wilbur & Williams Co., 130 Lincoln St., Boston 35, Mass. Rubber Coat Skid Grip Floor Compound, a product tested by The Underwriters Laboratories, is described along with other floor treatments.

NEW BOOKS

Electropolishing and Chemical Polishing. By Dr. Sakae Tajima. Published by Sangyo Tosho Company, Inc., Tokyo, Japan. 331 pages. Illustrated. Price, Yen 600 ($1.67).

This book outlines the origin and development of electropolishing, as well as the characteristics of electropolishing and chemical polishing. The required equipment and its employment in the proper processing cycles are discussed. Electropolishing methods for most of the metals in common use, as well as some not generally used, are described. Properties of electropolished surfaces, theory and mechanism of electropolishing, scientific and industrial applications of electropolishing are among the other subjects covered in some detail. Chemical polishing of many common metals is discussed. The book contains excellent literature references in addition to a complete subject and author index.

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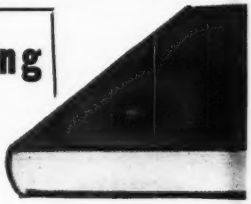
Modern developments in plating processes and methods



HERE are the basic theories and principles of electroplating—the practical methods and processes that are of invaluable use to everyone concerned with electroplating and electrotyping. The most efficient methods of making electrodeposits on more than 40 different metals, alloys, and plastics are summarized completely in this thoroughly revised and enlarged book.

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By William Blum, Chemist, U. S. Bureau of Standards and George B. Hogaboom, Consultant

Revised 3rd Edition
455 pages, 6 x 9
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Completely revised to make it a more practical working guide, this book summarizes and digests the best of modern practice in the field. It covers qualitative, quantitative analyses of solutions; pickling, dipping; electropolishing; electroforming, electrotyping; producing phonograph record matrices, and manufacturing tubes, etc. Metals are dealt with in the same order as in the periodic system of elements.

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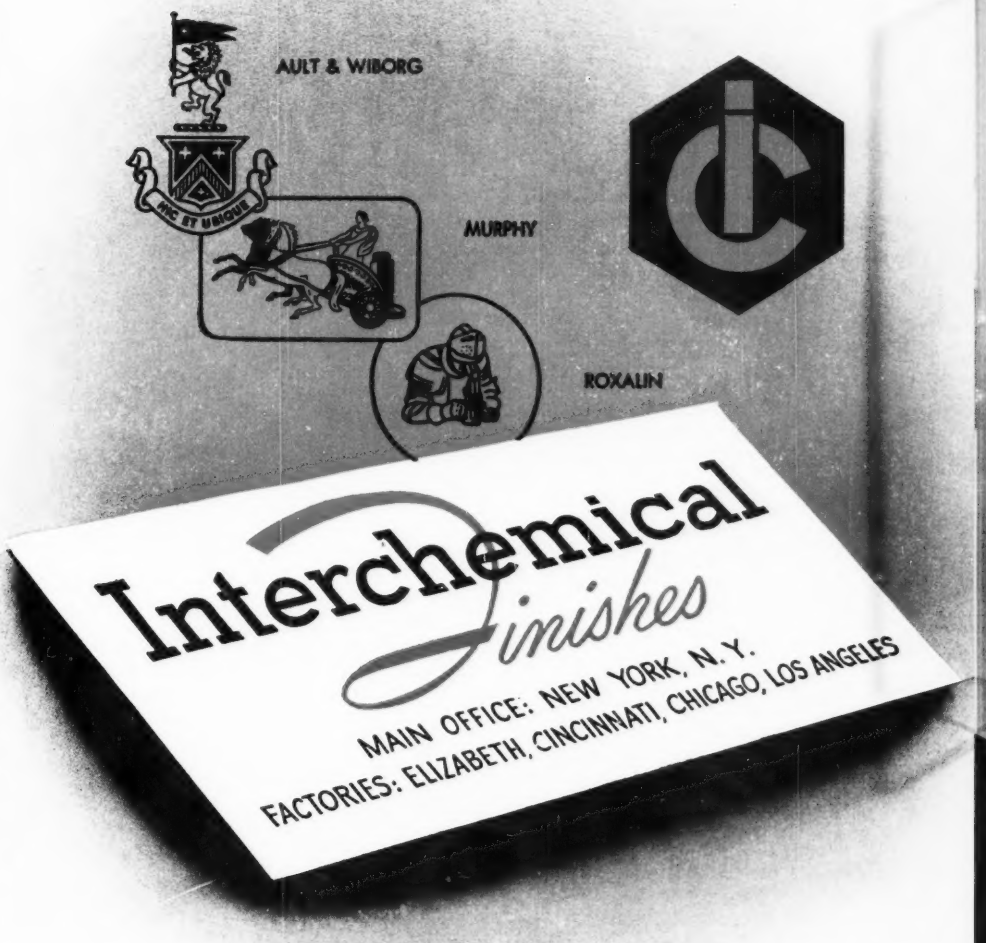

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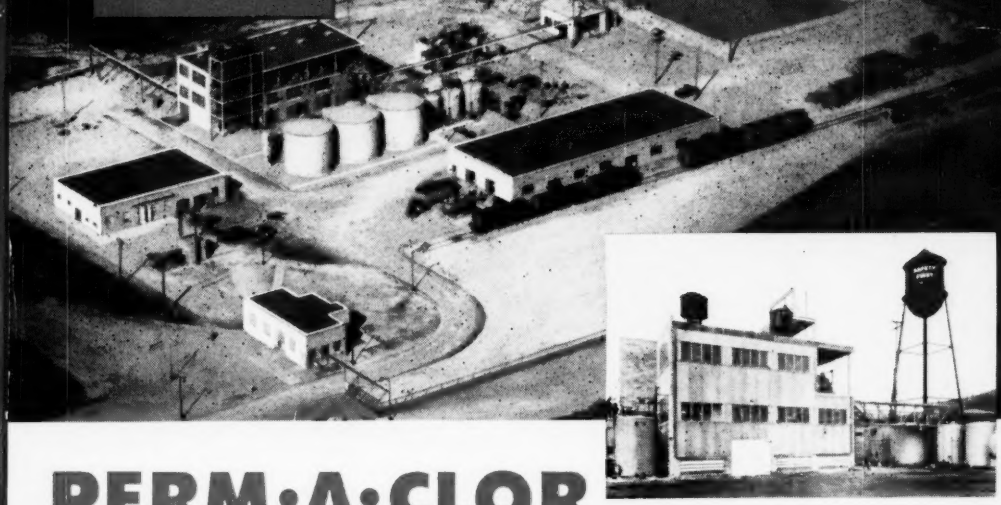

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